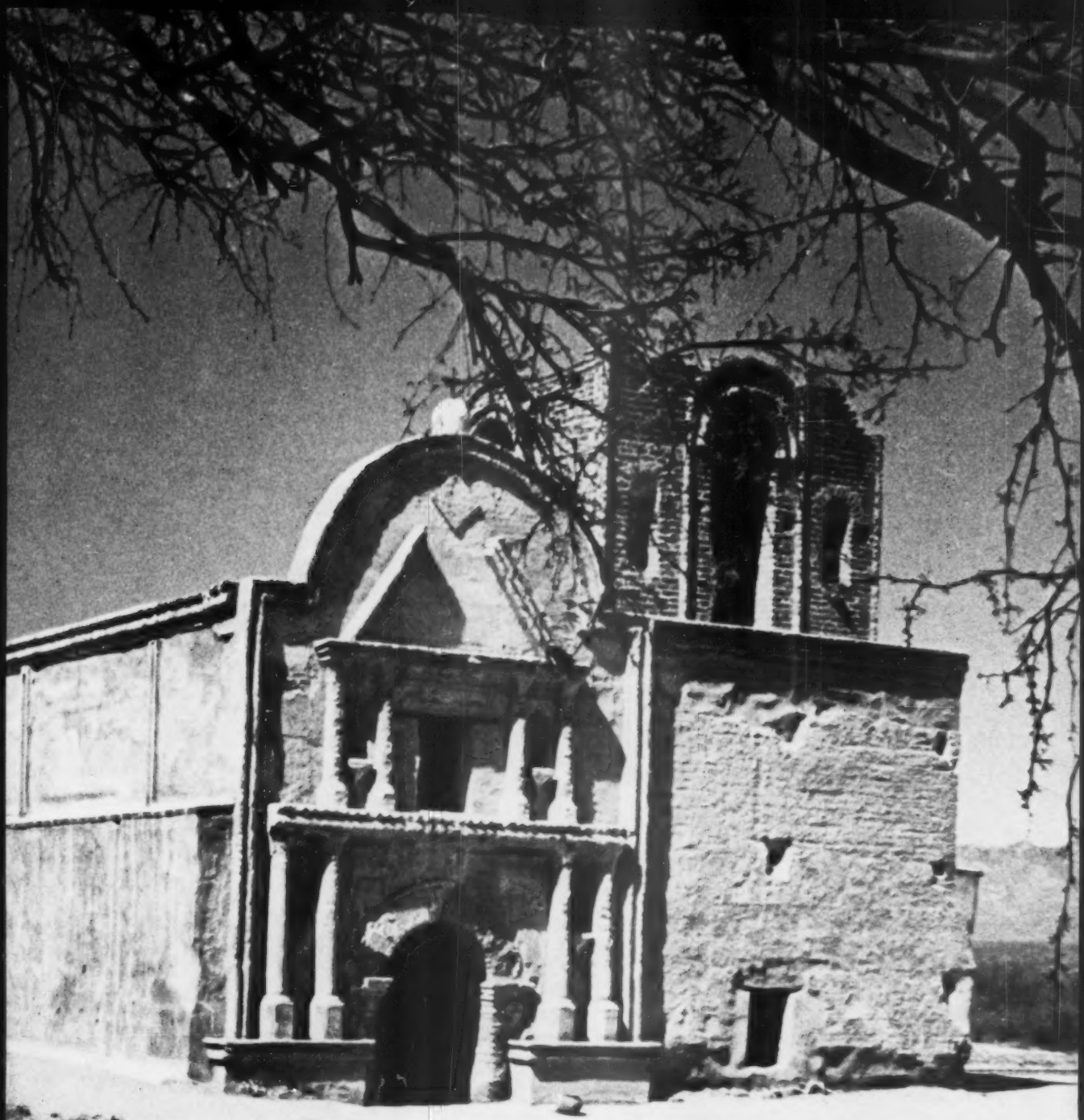

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PARKS

THE INTERNATIONAL JOURNAL FOR MANAGERS OF NATIONAL PARKS, HISTORIC SITES AND OTHER PROTECTED AREAS

PARKS

PUBLISHED BY THE INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES

Volume 7, Number 4 January, February, March 1983

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Cover: Tumacacori National Monument in Arizona, USA, commemorates an historic Spanish Catholic mission church which had its roots in the work of Jesuit Father Kino who celebrated mass near the site in 1691. The present massive structure, largely adobe, was started about 1800. About 1844 it was sold by the Mexican government to a private citizen. The US proclaimed it a National Monument in 1908. Recent preservation work has included participation by experts from ICCROM, the Rome Center which carries the full name of International Centre for the Study of the Preservation and the Restoration of Cultural Property. They worked to preserve historic plaster and paintings on the interior of the sanctuary dome and walls. National Park Service Photo: Richard Frear

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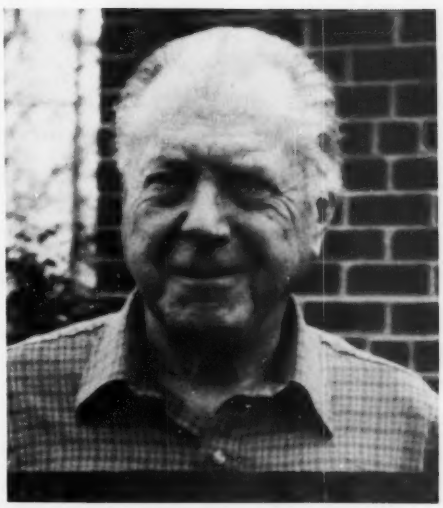
Special Notes on PARKS' Beginnings, With Thanks To Its Loyal Sponsors



Robert I. (Bob) Standish has retired as the founding editor of PARKS Magazine and has been succeeded by Jean R. Packard. Many readers of PARKS will recall that Bob was IUCN's Information Officer in Morges, Switzerland, from 1968 to 1975 when he returned to the USA to establish the magazine.

With this issue PARKS magazine completes seven full years of publishing. We believe the several thousand readers who have not been with us from the beginning should know a little about how the journal started, and who has been providing the money for its publication.

Over the years the need for exchange of information among nations on all matters affecting national park planning and management has been widely recognized. This need found expression in Recommendation 35 at the UN Conference on the Human Environment, (Stockholm, 1972) and later in 1972 as Recommendation 16 of the Second World Conference on National Parks.

First to respond to these calls was the US National Park Service. It proposed to IUCN in 1973 that one of its publications, *Park Practice*, be expanded to meet international needs. Further discussions led to a meeting at UNESCO in March, 1974, and here the idea of an international, multi-language, interdisciplinary journal was endorsed. Participating were IUCN, UNESCO, the US NPS, ICOMOS, ICCROM, IFLA, IUA and ICM. Prospects for funding, however, were too dim for the project to begin at that time.

Working unilaterally, the US National Park Service continued its efforts, and after further discussions with IUCN and others it was decided to go ahead with a journal. An editor was appointed and work began in Washington in May, 1975.

In June, 1975, Parks Canada and FAO met with US NPS in Quebec and decisions were made on the basic form, content and direction of the journal to cover a two-year pilot period (later stretched to two-and-a-half years). Parks Canada then took the significant step of offering to produce the complete French language edition in Canada.

In November, 1975, the National Park Service worked out a basic agreement to cover a substantial part of the production cost with one of its cooperating associations, Eastern National Park & Monument Association of Philadelphia, PA. In addition to providing funds, this organization also banked, disbursed and accounted for all monies.

In February, 1976, the Organization of American States (OAS) agreed to provide language translations and editorial services for the Spanish edition.

In April, 1976, UNESCO became the first UN agency to provide funding for PARKS.

Editorial work on the journal meanwhile had been carried forward and the first issue appeared in April, 1976, as a publication of Parks Canada and the US National Park Service, produced in collaboration with FAO, UNESCO and OAS.

In 1978 IUCN became the publisher for the consortium, and regular quarterly issues have continued to appear. It must be admitted, however, that money to pay all our bills at times has seemed out of sight. But through the generosity and cooperation of sponsors and cooperating organizations we were able to get the job done. We had several very good years, in fact, but then our support base narrowed, and by the spring of 1981 we were in very tight financial straits. Funds were so limited we were forced to take drastic action in order to survive. That was the decision to stop publishing in French and Spanish after Volume 6, Number 1.

We fully intend to resume publishing these editions, of course, but to do so will require donation of funds, or services, or both. We would be pleased to discuss our requirements for these editions with anyone who may be interested in sponsoring one or both of them.

PARKS is still a long way from being a financially sound operation, but we have demonstrated beyond any doubt that there is a keen demand for the publication in all three languages that can be met if our relatively small costs can be underwritten.

Over the past seven years help to the PARKS magazine project has been provided by a number of far-sighted countries and organizations. Some of this help has been very extensive. All has been essential to our survival, and it has enabled us to fulfill an international publishing need.

We wish to list all of the generous groups which have provided financial assistance or essential services, and to express our profound gratitude to them for their help and moral support.

Food and Agriculture Organization of the United Nations
United Nations Educational, Scientific and Cultural Organization
United Nations Environment Programme
Organization of American States
Australia (Federal and State governments)
France (Ministère de l'Environnement—D.P.N.)
New Zealand
Parks Canada
U.S. Agency for International Development
U.S. National Park Service
International Union For Conservation of Nature and Natural Resources
World Wildlife Fund—US
World Wildlife Fund—International
American Conservation Association
William P. Wharton Trust
Eastern National Park & Monument Association

From time to time we have considered charging a subscription fee in some of the countries where our readers are better able to pay. This is still a possibility, but its onset does not appear imminent. Quite simply, we see too many problems to be solved and services to be provided on a routine basis, all of which would cost us more than any reasonable subscription fee would bring in.

Beginning with this issue PARKS magazine has a new editor: Jean R. Packard. Mrs. Packard has been associated for many years with IUCN and with the Commission on National Parks and Protected Areas (and its predecessors). She is an experienced editor and administrator, and I am personally delighted that she has accepted the assignment. Readers should feel free to write to her on matters of a professional nature that concern us all, or about the journal itself. I know she would particularly welcome your suggestions for subjects and authors.

After nearly eight years as editor of PARKS, I find it a little difficult even to think about terminating my service. But retirement eventually comes to us all, and that time has come for me. Happily, however, Mrs. Packard and IUCN have insisted that I continue to serve as a consultant. I look forward to that.

My thanks and best wishes to you all.

—Robert I. Standish

Jeremy Harrison

Maintaining a Database On the World's Protected Areas

Manipulating conservation data by computer is still a relatively new field and it may be some time before governments develop their own information systems. IUCN is developing a strong capability in the use of computers in conservation, and this expertise is available to those needing assistance in setting up their own systems, including any governments who are interested. There are good reasons for an international organization maintaining a database on the world's protected areas, even though most countries have far more information on their own protected areas, and despite the ability of many countries to establish computer systems and maintain information in ways that meet their own needs.

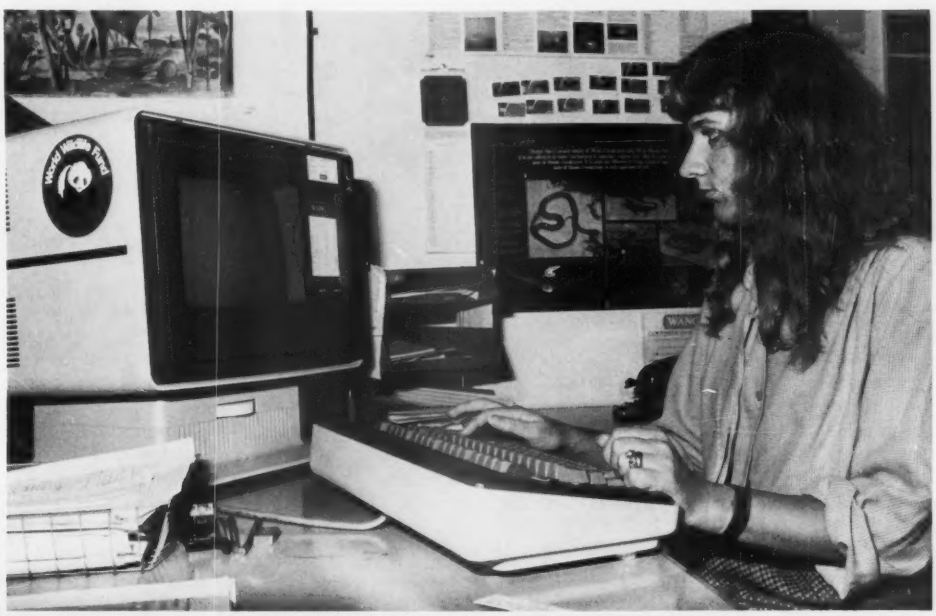
IUCN, the World Wildlife Fund, and other international conservation agencies, for example, need comparative information to help evaluate priority areas for allocation of scarce international conservation funds. Unesco's Man and the Biosphere Programme and the World Heritage Convention (Unesco, 1972) require global information on protected areas, the former in order to ensure that representative areas of all biogeographical provinces are established as biosphere reserves, the latter in order to ensure that sites nominated to the World Heritage List are of truly "outstanding universal significance."

IUCN's Commission on National Parks and Protected Areas (CNPPA) is in fact responsible for the technical evaluation of sites recommended for inclusion on the World Heritage List; the Protected Areas Data Unit (PADU) is the database where information on these sites is maintained. PADU is also responsible for maintaining information on sites listed under the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat (signed at Ramsar, Iran, February 1971).

There are also numerous examples of the value of a centralised source of information in the field of genetic resource conservation. Plant breeders, for example, may need to know where wild ancestors of domestic agricultural crops could be found in protected areas, in order to locate sources of genetic material for improving crop breeds. Information on the distribution of plants within a reserve, coupled with details of their traditional uses in food, health care and so on could be of immense value in the development of new crops, or of new or improved medicines.

Scientists may need information for their research on a wide range of topics. A behavioural ecologist studying primates in the Brazilian rainforest, for example, may need to know where in Africa or Southeast Asia he could conduct similar work; or a plant ecologist studying upland bogs in the United Kingdom may want to know where else in the world he can study such habitat in a protected area within easy reach of a research station.

International agencies would be able to design their projects to enhance sustainable development and to avoid adversely affecting sensitive areas if they could be provided with quick, large-scale "overviews" of certain questions concerning protected areas, and with details of the protected areas of the region in which they are working.



The Protected Areas Data Unit (PADU) is part of IUCN's Conservation Monitoring Centre which operates at Kew Gardens and Cambridge as part of UNEP's Global Environmental Monitoring System. Computer and word processing facilities were provided by the World Wildlife Fund.

In a similar way the international effort to promote protected areas, and to improve protected area management requires a centralized source of information for publications to respond to requests from journalists, and for other promotional and publicity uses.

Governments and protected areas managers need to know what is being done in the techniques of management in other countries in order to enhance their own efforts and to avoid repeating mistakes. Technical assistance may be required, for example, on some particular management problem, and a centralized source of information will be able to detail where this type of work has been done before, and by whom. In large countries (such as the United States of America) there are many different types of protected areas, run by a variety of agencies. In some cases the efforts being made to collect this type of information by PADU mean that such information is being collected in one site for the first time.

The International Union for Conservation of Nature and Natural Resources has been collecting information on protected areas worldwide since 1959, when a United Nations Economic and Social Council resolution charged IUCN with the task of forming and maintaining an up-to-date list of the world's national parks and equivalent reserves. This data collection is the responsibility of IUCN's Commission on National Parks and Protected Areas (CNPPA), and some of the information has been published over the years in the *UN List*, and in the *World Directory of National Parks and Other Protected Areas*.

In 1979 CNPPA began to collect data in a more systematic way with the appointment of "coordinators" to compile detailed information about protected areas in their parts of the world, and basic information has now been gathered for a large percentage of the world's protected areas (although the quality and completeness of coverage is still widely variable). Other material, such as maps, management plans, species lists, scientific papers, brochures, is also being collected.

Any increase in available information would, of course, be of limited use without an improved system for handling the data, so the Protected Areas Data Unit (PADU) was inaugurated in May 1981 as part of the IUCN's Conservation Monitoring Centre (CMC). PADU manages the day-to-day collection of information on protected areas for IUCN, and is responsible for disseminating that information as needed, and in the format required. CMC, which has offices at Kew Gardens and in Cambridge (both within the United Kingdom), operates under the auspices of the United Nations Environment Programme as a part of the Global Environment Monitoring System (GEMS). There are computer facilities at Kew (provided by the World Wildlife Fund), and these facilities are used to the full by PADU.

Data Collection

The information that goes into the PADU files is initially compiled by CNPPA members and correspondents in all parts of the world. These are frequently the government officials responsible for the protected area system of a country, but can also be academics, members of local non-governmental offices, or employees of international organizations. In most cases a "Protected Areas Information Sheet" is completed for each area by the CNPPA member who is most familiar with it, the sheets being reviewed by peers.

The information on these sheets is collected under a number of specific headings. These are listed in Table 1, but two of them (biogeographical province and management category) require further explanation. The "biogeographical province" in which an area is found is coded into "realm," "province" and "biome" after the system devised for IUCN by Dr. M. D. F. Udvardy in 1975. Briefly, the system divides the terrestrial part of the biosphere into eight major realms, and a much larger number of provinces. Each province is defined by significant differences in flora, fauna or vegetation structure, and is characterized by one of the world's 14 major biomes (the Atlas Steppe Province, for example, in the Palaearctic Realm, is a region characterized by a Temperate Grasslands Biome). This system has been modified recently but full details are not yet generally available. Management categories, defined in a 1975 IUCN report, are devised to indicate the actual protection a site enjoys (which may not be reflected by its official designation as national park, nature reserve etc.). Materials such as management plans, maps, field guides, and leaflets are also collected, and these are kept in manual files whenever they are available.

Table 1. Headings under which information is collected on the protected areas information sheets.

Name of Protected Area	Vegetation
Management Category	Noteworthy fauna
Biogeographic Province	Zoning
Legal Protection	Disturbances and deficiencies
Date Established	Scientific research
Geographical Location	Special scientific facilities
Altitude	Principle reference material
Area	Staff
Land Tenure	Budget
Physical Features	Local administration

This material may then be updated, corrected and added to using data from a wide variety of other sources including published papers, expedition reports and so on. In general a three-year cycle is being developed for updating the information. Based on the biogeographical classification of terrestrial biomes mentioned above, the world is seen as being divided into six regions, with the information from two regions being updated each year in conjunction with CNPPA working sessions in those regions. In 1982, for example, meetings were held in North America and in Southeast Asia, and in the previous year in Latin America and New Zealand. Updating consists of reviewing the existing sheets, making any changes required, and adding new or more complete information for certain data categories. This does not mean to say that the other regions are ignored in the intervening years, but that information is dealt with as it is received or as it is needed, there being no complete revision of the region's data.

The Storage and Use of the Information

Information is stored in the computer in both data processing and word processing files. The data file contains the basic details on all protected areas for which we have any information, regardless of size, protection or legal status. These details are mainly those on which we are likely to want to sort our information, but the files also contain codes to link the data with further information in the word processing files, and with other data files on plants, animals, references and so on. The word processing files contain the more detailed information sheets which are basically edited versions of those sent to us by the CNPPA coordinators. The advantage of using word processing facilities to store this information is that it gives us the capability to correct, update, reformat or otherwise edit the information sheet at will, while still having material that can be printed at a moment's notice.

Information from the data files can be sorted/selected using any combination of characters or groups of characters within the file. Lists could be produced for example of sites over 100,000 ha in Latin America, or on the national parks created since 1945. These lists could be laid out by political unit, or by biogeographical unit, in alphabetic order, by order of size and so on, by appropriate sorting and reformatting. PADU was responsible for compiling the *1982 United Nations List of National Parks and Protected Areas* for example. This involved selection of data from the main data file, sorting it by country, then by management category within country, size within management category, and then formatting the resulting list into a readable (and hopefully understandable) table.

The data files are in fact quite flexible and can be reformatted and extended as required. In the near future codes for habitat will be added so that areas sharing a particular habitat type can be selected (this can only be done rather crudely for biome type at the moment). Codes will also be given which signify the accepted international importance of the site. At present World Heritage Sites and Biosphere Reserves are coded within the main file, but this coding is being extended to include sites listed under the Ramsar Convention, sites within the European Biogenetic Network, sites holding the European Diploma and so on.

PADU is being used by IUCN and its Commission on National Parks and Protected Areas to help monitor the protected areas of the world and hence to help in focusing the Commission's priorities. By carefully assessing the coverage by protected areas of each biogeographical province on land CNPPA will be able to identify gaps in the world-wide system of reserves. A parallel classification system, based on both biogeographical and biophysical criteria has been developed for coastal and marine protected areas and will be used in the same way as the terrestrial system when the full details become available. Using these two systems, it will then be much easier to chart the development of new areas year by year, and to focus attention where it is most required.

PADU is also developing publications of a more detailed sort for IUCN/CNPPA. Initially it is planned to produce volumes on each of the eight Biogeographical Realms. These books, which give basic details on the protected area networks of each country and one or two pages of information on each protected area, are intended to serve as handbooks for the protected areas of each major land mass. The first volume (on the Neotropical Realm) was published last year by IUCN, and the Afrotropical Realm is now under study. The capacity is also there to produce publications on request; a volume on a particular country, for example, or on the protected areas of tropical rain forest around the world, on all the protected areas containing tigers, bowerbirds, or coco de mer, or on those areas set up to protect important watersheds. Some of these would be more difficult to produce than others, but we already hold much of the necessary information.

The unit does not work in isolation, but as an integral part of IUCN's Conservation Monitoring Centre. Close collaboration with the CMC researchers, dealing with information on threatened plants and animals, is beginning to produce useful information on the distribution of threatened species within protected areas and in many cases on the effectiveness of the protection afforded. The International Council for Bird Preservation is looking at centres of endemism, particularly in Africa, and information on how these centres are covered by protected areas can be found in the PADU files.

One of the principal aims of the Conservation Monitoring Centre is to improve IUCN's ability to provide comprehensive information on specific conservation issues. Work is currently in progress to connect the different components of the centre more closely by linking the computer files of plant, animal and protected area data, and by linking these more efficiently with geographical information, with references from the conservation literature, and with details of conservation projects (Mackinder in press). The closer these links become, the more comprehensive the available data becomes, and the more valuable to IUCN and to conservation.

PADU will produce nothing that could not have been produced by members of the IUCN/CNPPA, given sufficient time and energy. The unit will provide only what is fed into it, but it will be able to produce the data very quickly and in many different configurations. It will not replace any of the human element in protected area management, but it will allow managers to be more efficient by providing the data needed, when it is needed, and in the form required.

More importantly, the collection and presentation of protected areas information in a professional and competent manner demonstrates to governments, development agencies, and individuals around the world, that national parks and reserves are valuable land-use tools for managing areas which should, for various reasons, be kept in a natural or semi-natural state. Making protected areas data more accessible will help to ensure that the reserves can play their proper role in the process of socio-economic development.

To do this, however, needs the assistance of those in the field with direct access to the data. Our information needs constant checking and additions, and materials such as maps, management plans, scientific papers, and species lists are still required for the vast majority of the world's protected areas. Any help we can receive in this area would be more than welcome, and would help to ensure the accuracy and usefulness of the advice given to conservation agencies and land-use planners.

The continuing expansion of protected areas, and the development of the existing networks is going to require more effective management in the future. Clear objectives will need to be established for each area, and management will need to focus its activities in order to attain these objectives. This is especially true when there are many alternative demands on an area. Effective management depends ultimately on knowledge, and the dissemination of that knowledge. Knowledge can be, and is being, gleaned at a local level by scientists and conservationists throughout the world, but dissemination of information, and analysis and synthesis of that information, needs an international effort. This is what IUCN, its Commissions, the Conservation Monitoring Centre, and its component parts are trying to do, and the more help they can get the more effectively they will be able to do the job.

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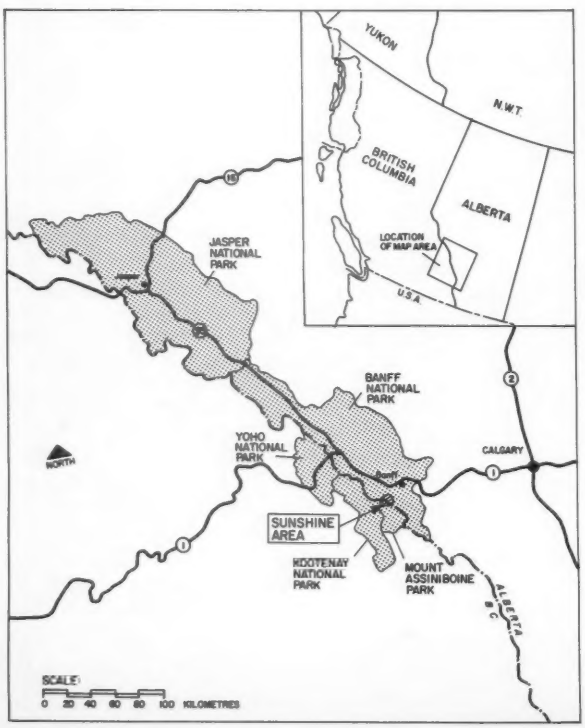
Jeremy Harrison is a member of the IUCN Conservation Monitoring Centre staff, and is responsible for running the Protected Areas Data Unit. He can be contacted at the Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey in the United Kingdom.

Martin Francis Price

Management Planning in the Sunshine Area of Canada's Banff National Park

For the past three decades, the rapid increase in visitation has been of major importance for agencies entrusted with the management of parks in mountain areas. Within the Canadian national park system, the four parks in the Rocky Mountains (Figure 1) experience both the highest levels of visitation (9.06 million people in 1979-80), and the greatest increases in visitation — on average, 6 percent over each of the last 10 years. It has been estimated that less than 20 percent of the visitors to these four parks travel more than one mile from a road. However, this minority of visitors is well over a million people each year, and is of major concern in developing management practices. While use levels in backcountry areas generally rise at a similar rate to those for the parks as a whole, changes in access to limited areas can cause significant short-term variations in local use levels. This article describes the development of a program for the management of an alpine area, in Banff National Park, which will soon experience a major increase in accessibility and consequent levels of use.



Background to the Study

The Sunshine area is situated on the Continental Divide, 10 km southwest of the town of Banff. The area has a long history of low levels of summer use, starting in the early 1900s. At present, the total number of visitors during the summer season (July to September) is between 1,500 and 2,000 people. However, since the 1940s downhill skiing has been the predominant recreational activity in the area, based at Sunshine Village, a commercial resort within the park boundaries. Thus, use levels are significantly higher during the winter season (November to May): 445,000 skier-days were recorded during the 1980-81 season. The majority of skiers at the resort come from the rapidly growing city of Calgary, 130 km distant.

In 1974, the management of Sunshine Village prepared a long-range plan for the development of further skiing facilities. Since the ski area is within Banff National Park, this plan was the subject of a public enquiry in 1975. During the enquiry, participants accepted the need for increased skiing facilities. However, considerable concern was expressed over the future of the alpine Sunshine Meadows (Figure 2) which adjoin the ski area. The Meadows are of international botanical importance, both because of the unusual assemblages of plant species, and because of their size. Living at the limits of existence, this vegetation and the associated soils are highly susceptible to damage as a result of human use, and consequently an extensive trail system has developed through the Meadows, although summer use levels over the past 80 years have remained low.

Figure 1 — *Parks in the Canadian Rocky Mountains. The four National Parks receive very high levels of use: 10 million visitors a year by 1984, travelling along the major highways shown on the map. Mount Assiniboine Provincial Park will experience increasing levels of use when summer accessibility is increased through the use of the cable-car to Sunshine Village.*

Figure 2— *The Sunshine Meadows. This area is of major botanical importance, being the largest area of alpine meadows in the Canadian Rocky Mountains, and having a large diversity of alpine plant species, many of which are at the extreme limit of their geographical range.*

A major area of concern during the public enquiry was that the construction of a cable-car to Sunshine Village, an integral part of the proposed development, would improve summer access to the Meadows. In view of the fragility of this area, it appeared probable that increased levels of summer use, due to the improved access, would result in major and irreversible environmental changes to the Meadows unless an informed management methodology was developed. Thus, a research study was undertaken, during the summers of 1979 and 1980, to provide data concerning the trails and biophysical environment of the Meadows, and to develop an informed management strategy for the area [Price 1981].

Techniques Employed

During the 1970s a large number of studies were undertaken with the intent of providing information relevant for the summer use of mountain areas [Cole & Schreiner, 1981]. In general, these studies were highly site-specific, with subjective methodologies which were difficult to reproduce or transfer to other areas. Consequently, it was decided that the 1979-80 study in the Sunshine area should employ reproducible, objective techniques. Thus, the methods developed during the study could be used in repeat surveys to assess future change in the study area, and would also be applicable to other areas. In order to fulfill these objectives, the techniques of photographic remote sensing, supported by the collection of data at ground level, formed the basis of the study.

Remote Sensing

Photographic techniques have not been widely used in recreation-ecological studies, although awareness of the potential, and cost-effectiveness, of photographic techniques has increased within management agencies in the past few years [e.g. Dalman, 1978; Draeger & Pettinger, 1981]. For the management of recreation in alpine areas, photography has three major advantages over the collection of data at ground level. First, since the field season is short, and weather is often unsuited to extended periods of sampling, it is advantageous to be able to collect large quantities of data during suitable periods, which can later be analyzed in the laboratory. Second, an entire landscape can be recorded, rather than a sample chosen in the field, which may be atypical. Also, information originally not viewed as important may be recorded, and later prove of use in the analysis. Third, the photographs provide an objective historical record with which future changes in the physical and biological environment can be compared at any time.

Aerial Photography

The primary technique utilized in the study was multifilm, multistage, multidate photography. This involves the acquisition of imagery of a selected area using different film/filter combinations at increasing scales, and on different dates, respectively. Three film types were used in the study: panchromatic, colour negative, and false-colour infrared (FCIR). The major advantage of the FCIR film, over the others, is that reflectance characteristics within most of the visible and near-infrared spectrum were recorded. This permits the interpretation of both changes in visible reflectance, caused by changes in pigment composition (which would also be recorded on the two other film types), and concurrent structural and foliage density changes. In addition, the ease of use and reliability of interpretation of FCIR film is greater [Knipling, 1969]. However, panchromatic and colour films may provide more information for some purposes.

Films were exposed at three scales: 1:36,000, 1:8,000, and 1:4,000. Each of the hierarchical series of scales was chosen for specific purposes: 1:36,000 for a general overview of the study area and its landforms in relation to the surrounding area, and to be used in the creation of an orthophoto mosaic at a scale of 1:10,000 to serve as the base for a vegetation map of the study area; 1:8,000 principally for vegetation mapping, and also for the mapping of human impacts on vegetation; and 1:4,000 for the detailed mapping of human impacts on vegetation, particularly trail development.

Only the 1:8,000 scale photography can be described as "multidate." Colour and FCIR imagery at this scale was obtained during two parts of

the growing season. The reflectance characteristics of all plant communities change during the growing season: multidate photography provides the means to differentiate between communities on the basis of these changes. Similarly, changes which are evident on one film type may not be evident on another; this is a further reason for using two film types on each occasion.

The imagery as a whole provides a historical record of the vegetation and human impacts at the times of photography. This information can be objectively used in the future to assess the degree of changes consequent on human use of the area, and natural successional change.

Ground Truth Surveys

Aerial photographs alone are not adequate to plan management strategies. Thus, two ground level surveys were conducted, as additional inputs to the planning process. In order to relate the units identified on the photographs to discrete vegetation types, a vegetation survey was undertaken at systematically selected sites throughout the study area. This "ground-truthing" process forms a standard part of any remote sensing project, since it provides a means to assess the accuracy of identification of the features under investigation — in this case, vegetation types — on the imagery. In addition, data were collected which related the occurrence of particular vegetation types to topographic and environmental variables, such as altitude, aspect, slope, soil depth, and the depth and duration of snow cover. The other ground level survey involved the assessment of damage at 102 transects throughout the area, and included the collection of topographic data, and the identification of undisturbed vegetation types adjacent to each transect. Transects were also photographed to provide a permanent record of trail damage, for comparative analysis in future years. Once the aerial photography and the data from the two ground level surveys were available, a synthesis of this information was undertaken, as an input for management planning for the area.

Development of Management Strategy

Trail Route Planning

The principal tool developed for the management of the study area is a 1:10,000 scale map showing vegetation types, and geomorphological features such as talus slopes and cliffs. When used in conjunction with the data from the vegetation and trail surveys, this map can be used both to plan new trail routes, and to decide which trails should be opened at a particular time during the hiking season.

Results from the vegetation survey show that the vegetation types in the area can be ordered along gradients of elevation, snow depth, snow cover, soil moisture level, and soil development (Figure 3). The results of the trail survey reveal that the degree of trail damage can be related both to the occurrence of vegetation types along these gradients, and also to slope angle. In general, the susceptibility of a vegetation type to hiking damage at a given time is primarily a function of soil moisture levels, and the time elapsed since snowmelt.

Alpine vegetation is most susceptible to damage during the first part of the growing season, immediately after snowmelt. There are two major reasons: (i) most of the growth of alpine plants occurs during the first few weeks after snowmelt [Billings, 1974], and (ii) soil moisture levels are high during this period, permitting soil compaction and erosion, which result in root damage and the creation of minor erosion channels. Major precipitation events during the summer also raise soil moisture levels, and consequently increase the likelihood of damage.

Figure 3 provides an indication of the susceptibility of different vegetation types to hiking damage. The types to the left of the graph have shallow, poorly-developed soils, an early snow release, and have a low susceptibility to hiking impacts. Examples include the *Dryas hookeriana* and *Kobresia bellardii* types. Toward the centre of the graph, the vegetation types have increasingly deeper soils and later snow release. Generally, this trend is associated with a decrease in slope angle. Thus, the types further left on the graph (e.g. vegetation dominated by *Phyllodoce glanduliflora, Antennaria lanata* and *Salix arctica*) have a lower susceptibility to damage than those where *Carex nigricans* is dominant or codominant. The types to the left of the *Carex nigricans* type have relatively deep, water-saturated soils, and a late snowmelt, contributing to a high susceptibility to hiking damage.

Thus, when planning trail routes, care should be taken to avoid the vegetation types to the right of Figure 3, since they have a high susceptibility to hiking damage throughout the season. When the location of new trail routes is being considered, the 1:10,000 scale map should be used to locate the vegetation types near the centre of Figure 3. Potential routes, which pass through these types, should then be surveyed in order to avoid areas of steep slopes. In this way, it should be possible to locate or reroute trails so that their potential impact will be minimized. For existing trails, Figure 3 can be used in conjunction with the map to decide the order in which particular trails should be opened during the hiking seasons. Trails passing through vegetation types toward the left side of Figure 3 will lose their snow earlier and dry out faster, and consequently may be opened earlier, since the likelihood of damage will be lower than along the trails which are still snow-covered or have high soil moisture levels. However, although the spatial pattern of snowmelt is constant from year to year, the

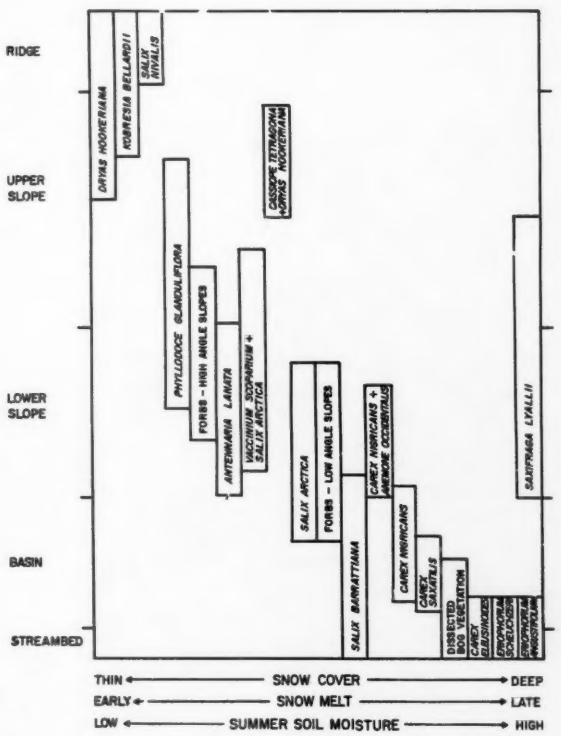


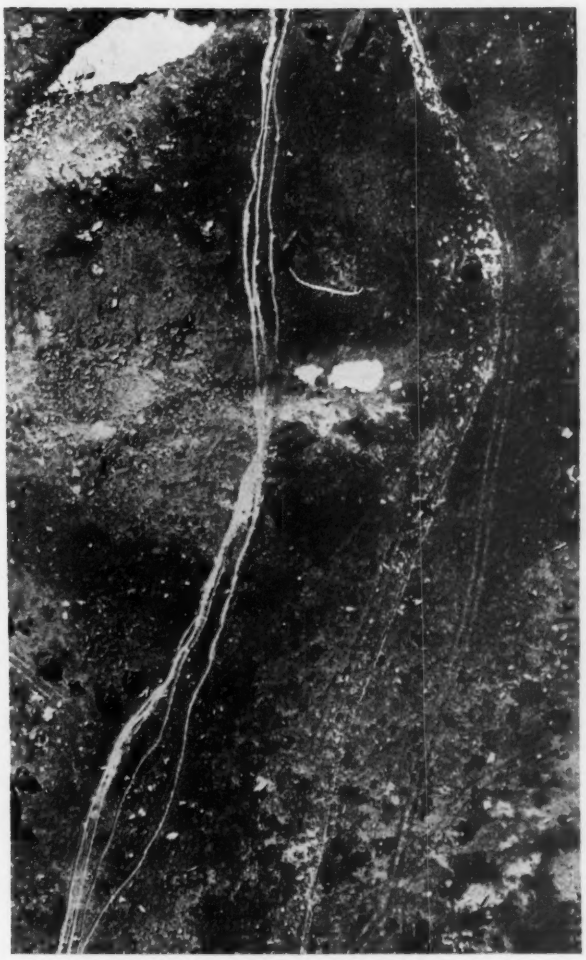
Figure 3—*Relationships between microclimate variables and topographic site for plant communities in the Sunshine area. Each vertical bar indicates the range of sites in which plant communities, dominated by the named species, may be found. This graph can be used to assess the susceptibility of plant communities to hiking impacts, and hence for trail location.*

timing of the melt varies, so that decisions to open a trail in any given year must be based on the observations of snowmelt at selected sites in the area.

Trail Improvement

The techniques described above form part of the strategy to minimize future environmental impacts, resulting from hiking in the study area. Another part of the strategy is to improve the quality of existing trails, in order to provide a comfortable walking surface from which visitors are unlikely to stray. The recommended measures for trail improvement include the most successful techniques developed in North American alpine areas during the 1970s. In particular, the number of parallel trails at any point in the trail system should be reduced to a minimum, and then stabilized. This requires the transplanting of vegetation from between the existing parallel trails, and the incorporation of drainage structures, to leave one principal trail. This remaining trail should be surfaced with gravel, and defined with rocks on the downslope side, where necessary. Various alternatives exist for the transport of gravel to worksites along the trails: helicopters [Erdman, 1980] or overland transport using either narrow-wheelbase vehicles in the summer, or oversnow vehicles during the winter. In the Sunshine area, the last alternative appears most cost-effective, since the vehicles are already available, and potential environmental damage would be minimized.

The gravelled trails should be wide enough for visitors to walk abreast and pass each other, and at particularly scenic or interesting points, trails should be widened to permit visitors to stop. These measures would minimize the number of people who step off the trail.



Alpine terrain is fragile and recovery from damage often requires many years. Hikers caused the braided trail on this steep slope in the Sunshine area, and the parallel tracks were made by the single passage of one 4-wheel drive vehicle. These tracks were 12 years old when this photo was made.

Environmental Education

The final part of the management strategy for minimizing the environmental impacts resulting from hiking is the establishment of an environmental education program in the Sunshine area. The principal theme of this program will be the fragility of alpine areas: their high susceptibility to damage as a result of human use. The program is designed to increase visitors' awareness of their relationship with natural environments, so that concepts learned by visitors to the Sunshine area can be transferred and applied when visiting other natural areas.

Monitoring Program

Any management strategy, no matter how complete the information on which it is based, must contain the capacity for improvements, based on assessments of the effectiveness of the strategy. To provide these assessments, monitoring programs have to be undertaken. The techniques used in these programs must be easily replicable and provide a direct input to management decisions. All of the techniques developed during the 1979-80 research program fulfill these criteria. Three monitoring programs are to be implemented in the Sunshine area, relating to visitor use levels, vegetation and trails.

The environmental impacts of hikers depend on their distribution in space and time. Thus, one input to the management strategy for the Sunshine area must be an accurate knowledge of use levels on different trails at different times during the summer season. These data can be collected through the use of questionnaires, infrared or pressure-sensitive trail use counters or direct observation.

Vegetation monitoring will utilize the aerial photographic and ground-level measurement techniques outlined earlier in this article. The new data will be compared to the baseline data collected in 1979 and 1980 to assess objectively the degree of change in the vegetation of the area. Vegetation monitoring will take place every five years, unless major changes appear to be occurring, in which case the time interval will be decreased.

Trail monitoring will occur every summer. Permanent trail transects will be photographed and measured to assess whether changes are taking place. Any changes may then be related to information concerning the distribution of hikers along the trails throughout the hiking season.

The Future of the Sunshine Area

The majority of the management and monitoring programs proposed as a result of the 1979-80 research program are now being implemented by Parks Canada and Sunshine Village. Consequently, the integrity of the Sunshine Meadows should be retained through this joint venture of a government agency and a private company. In this way, the primary mandate of national parks will be fulfilled: to provide opportunities for the enjoyment and education of visitors to these parks, while leaving these important areas unimpaired for the enjoyment and education of future generations.

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Martin Francis Price received his first degree, in Natural Environmental Science, from the University of Sheffield, England. The work described in this paper was undertaken as part of a master's degree in Environmental Science at the University of Calgary, Canada. He is currently working with an environmental consulting company in Calgary.

All photos: Martin Price

A large part of the Sunshine ski area appears in this photo taken May 30 after the ski season had closed. The top station of one lift and four other lifts are visible as well as a number of ski trails.

Miklos D. F. Udvardy

Finland Expands Its Protected Areas

The Fall 1982 issue of *Finlands Natur* brings news about nature conservation in the "land of thousand lakes." As a result of 1981 legislation, a number of protected areas have been founded, and others considerably enlarged during the past year. Six of the existing national parks of Finland were expanded to incorporate additional, neighbouring acreage, and early in 1982 eleven new national parks were established. Proposals for two more national parks, in form of a bill before the legislature, await approval this winter.

Finland also has nature reserves, which are smaller undisturbed virgin areas set aside mainly for scientific study and not for public use. Five new such reserves bring the total number to 20.

A new type of protected area was also created by the 1981/82 legislation, viz. "bog reserves." Bogs are of common occurrence in the taiga belt of northern Europe and Asia, where the granitic rock substrate has been scoured out by the ice shield of the Pleistocene glaciations and where water now accumulates and saturates the soil. Finnish and other Scandinavian scientists pioneered studies of bog ecology and history; thus it is fitting that Finland made this first step in conserving 59 areas where the most interesting bog types occur. Bogs are in danger of draining and dyking, especially in the southern, populated parts of Finland. Whereas this centuries-old process provided much useful pastureland, the present initiative assures that samples of this ancient and original landscape element will remain protected and preserved.

The Finnish National Parks offer a variety of spruce and pine forests, rocky promontories and moraine hills, blue- and black-water lakes and tarns or blue streams and large muskegs which provide a fascinating and pristine-appearing landscape, and can be found in every part of the country. Most national parks have been chosen to protect the most original, spectacular and virgin areas, such as the new Helvetinjärvi National Park in south-central Finland, untouched wilderness centered around Helvetinkolu, which is a narrow cleft ("Hell's Cleft") widening into a spectacular ravine, and several picturesque lakes. The now enlarged Linnansaari National Park consists of an archipelago of rocky and forested islets in the middle of Lake Haukivesi, a part of the Saima lake system which stretches across most of middle Finland. Besides the beauty of landscape, some 20 extremely rare and endangered landlocked seals (Saima seal) live within the park boundaries—perhaps one-fifth of the total population.

With the present enlargements, Finland's largest national park, the 2,800 square km Lemmenjoki National Park in the Lapland fells, became the largest national park of Europe. Besides forested and tundra habitats, such rare or endangered mammals and birds as bear, wolf, wolverine, otter and golden eagle are found here. The park is adjacent to Övre Anarjokka National Park of Norway along the boundary of the two countries; the two parks together cover some 4,000 square km (about 1,545 square miles) and form the largest protected wilderness of Europe. The new Koilliskaira National Park is expected to cover 2,530 square km (close to 1,000 square miles).

From the statistical data given by the National Parks Office of the Finnish National Board of Forestry it can be seen that the total area of national parks, viz. 6,573 square km (2,538 square miles), comprises 1.95 percent of the total area of Finland. This figure is still far from the goal of 5 percent, which experts of the World Congress on National Parks recommended in Bali in October 1982, yet it is an impressive figure and puts Finland among the leaders in advancing the conservation of natural landscapes.

Dr. Miklos D. F. Udvardy is a professor of Biological Sciences at California State University, Sacramento, USA. He devised the classification system for protected areas now used by the IUCN in 1975 ("A Classification of the Biogeographical Provinces of the World"), in the United Nations List of National Parks and Protected Areas, and other publications. This material was based on an article in Finlands Natur, *a Swedish-language conservation monthly magazine.*

E. Anthony Abrahams

Tourism Promotion: A Shared Place in the Sun

To fully understand the crucial existing and potential role of tourism as a development tool in our developing world, I think it is important to have a realistic grasp of its overall size, diversity and nature. The industry is often wrongly perceived as frivolous and basically inconsequential to economic and related growth since it caters to consumer leisure time activities that are disposable. More than a few developing countries and their governments, some of them in this Hemisphere, are failing to make this appraisal and are paying a price for it. Not just an economic one, but cultural as well.

Tourism today is the world's second largest industry in terms of international trade, second only to oil and just edging out the manufacture of arms for second place. Conservative estimates tell us we are speaking of an industry that generates some $95 billion annually, worldwide.

Most tourism takes place within countries that have large land masses. A great deal of international tourism also takes place between border countries, tourist traffic between, for example, France and Spain, Britain and France, Canada and the United States, and between the United States and Mexico.

Not unlike other major industries, a large portion of the huge $95 billion tourism industry takes place between developed countries, and the rich are getting richer while the poor are getting poorer in terms of attaining their share of the overall tourism pie. The flow of tourism between, for example, Japan and the United States, and between European countries, is much greater than the flow between Japan and the Philippines, the Caribbean and South America, or Europe and Africa, looking at it hemispherically. There are reasons for this. One of the biggest motivational factors in tourist travel is the wish to return to one's roots, so to speak, with Irish Americans going back to Ireland, French Americans going back to France and Canadians going back to the various European countries from which their ancestors originally came.

The critical consideration of developing countries is, of course, how to increase the inward flow of tourism to their economies from countries with populations that can afford to travel. In this context, when we talk of tourism and travel, we are speaking of a leisure industry that entails a very disposable expenditure and consumption choice, frequently over purchasing other big-ticket items such as a new car or home. The industry is therefore, by its very nature, susceptible to economic fluctuations in the home country that tourists travel from.

Keeping all that in mind, tourism can be the key to continued, broader economic growth and prosperity for the people of developing countries. In fact, it is often the most easily available key to that growth. For despite the very real certainties and uncertainties of a sensitive industry, not to mention a host of critical internal considerations like maintaining a unique and distinct identity against a tide of foreign visitors (some more appreciative of what they see and who they meet than others), tourism is quite possibly the most natural way for developing countries to evolve economically.

As a major employer of labor, tourism is a diversifier of the overall economy, with hotels, for instance, purchasing a wide variety of goods and services that have a powerful secondary effect on the entire economy. It is also a significant earner of vital foreign exchange. In an economy like Jamaica's, as well as other developing countries in the region, these are traditionally the weakest structural areas: balance of payments, employment and diversification. Few other industries have such a broad impact on so many lives, directly and indirectly.

Jamaica is a case in point. Tourism employs about 10,000 people directly, about 20,000 indirectly. It earns some $300 million plus annually, making it the country's second largest foreign exchange earner after bauxite, and it is fast becoming the largest.

It is important to the future, in my view, that tourism as an industry be based on a natural comparative advantage. It has to be. If we were, for instance, to begin manufacturing automobiles in Jamaica, it would mean having to bring expensive technology from abroad and to compete with countries that will probably always build them more economically than we ever could. In the case of Jamaica, the natural as well as developed ingredients for successful tourism are already in place. Our country was almost born for it.

We have the technology for running a tourist industry well within the existing horizons of the Jamaican people. We are beginning to develop a tradition of hospitality. Our tourism is based not only on the distinct cultural feel of Jamaica, or on its historical interests, but on climatic considerations as well. Two-thirds of our visitors come to us between December 15 and April 30, and in those months they pay roughly twice as much to come as they would in the summer months. The fact that they come in such numbers in the winter is interesting since that is not generally a peak period for travel worldwide.

Our current challenge—and we have many—is to develop our tourism product to the point that we can attract a bigger share of the even bigger market of people who travel in the summer. To succeed we must enter an arena with more competition than ever, without the benefit of having the warm climate winter advantage like we have at our peak tourist period. In the North American market, for instance, we will be competing with existing regions in the United States, in the Southeast and along the West Coast, making a case that our beaches, climate and extraordinary range of tourist attractions — even though in some cases farther away — can match and exceed theirs at the same price or less.

We are undertaking this latest challenge less than two years after many thought our industry would not survive, let alone recover, from several consecutive years of decline in visitor arrivals following political turmoil and unrest. But we did more than recover. Between April of 1981 and April of this year (1982), Jamaica witnessed a 29 percent increase in tourist arrivals. An extraordinary achievement in light of the fact that all of our neighboring islands, with the exception of Cayman and Aruba, experienced decline during the same period, largely due to an unsettled worldwide economic situation. Over the last three months, Jamaica has been running about 15 percent higher in tourist arrivals than at any time in the entire history of our nation.

I am frequently asked how could not only Jamaica but the Caribbean region as a whole better exploit its tourism potential? Many of the answers apply to developing countries throughout the Hemisphere.

One of the unfortunate fallacies about the tourist industry, at least in the Caribbean, is that we tend to think we compete with each other to a greater extent than I think we really do. In all my years of association with tourism in the region, the islands have moved together. Usually when tourism is growing in one island it is growing in all.

Generally speaking, the Caribbean gets just a small share of the overall travel market, so it does seem sensible to encourage competition among islands. A more interesting perspective is to look at the Caribbean vis-à-vis Mexico or Hawaii. We have never really made a concerted effort to create any regional tourism plan. Our regional institutions never had any real teeth to develop tourism throughout the area because they have focused more on issues that lead us to think we are competitors. I have to believe that if we combined all the money we are now spending individually and spent it in a coordinated way, with a unified marketing approach emphasizing the individuality of each of the islands, we would attract many more tourists to the region as a whole and end up with much more tourism clout. Maybe in theory it seems impractical, a pie in the sky as it were, but if developing countries in the region were to join forces, everyone would benefit more in the final analysis against increasingly strong competition from developed countries.

How can nations individually and regionally better stimulate the business of tourism while they are still developing? From my vantage point, the single most important factor toward success is the priority each nation attaches to tourism in the first place. Priority in terms of the portion of their national resources they devote to development and promotion. Jamaica's success during the past two years has been based, in part, on strong doses of both. Priority in terms of the consideration tourism is given in formulating educational, social and foreign policy. Some conscious decisions must be made in which economic benefits are balanced against the social costs of having a tourism-oriented society. Making those decisions and determining the sort of priorities tourism will be given are the first steps toward developing tourism nationally.

Based on my experience as an advisor to the Organization of American States, I would say that the most important philosophy that developing countries in today's world need is to approach tourism in a cost-effective way. In other words, looking at what such an industry would cost, and what they stand to gain from it.

For some reason, tourism has not invited much scholarship. Yet it is badly needed. I would say, for instance, that the strategy and planning required to develop the quality of tourism facilities, along with the necessary broad governmental policy support, are really substandard throughout most of the Hemisphere, with a number of notable exceptions—most of which are in the Caribbean. I for one think this is because countries have never really put pen to paper in looking at the cost-effectiveness of spending funds on researched marketing objectives and gaining a knowledge of their tourism audiences.

One has to wonder how much more successful each developing nation's tourism policy would be if its neighbors in the region decided to band together and collectively become even more competitive in the world marketplace.

E. Anthony Abrahams, who serves his government as both Minister of Tourism and Minister of Information, received a B.A. in economics from the University of the West Indies in Jamaica and studied at Oxford University in England as a Rhodes scholar. From 1978-80 he was an OAS Regional Director of Tourism Programs, with responsibilities for technical assistance projects in Central America and the Caribbean.

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Wildlands and wildlife draw a special kind of visitor to the Latin American jungles, to remote areas such as the Galapagos' Plaza island, shown here with its native sea lions welcoming a group of tourists. Photo: Alan W. Moore

Tourists in Latin America and the Caribbean can sample such diverse delights as unspoiled beaches or the bustling cities with their myriad sophisticated attractions. An important development tool, tourism is the world's second largest industry in terms of international trade. Photos: Anne LaBastille and Gary Wetterberg

PARK TECHNIQUES

Preservation of Adobe Buildings

This article discusses the traditional materials and construction of adobe buildings and the causes of adobe deterioration. It also makes recommendations for preserving historic adobe buildings which suffer from the same causes of decay as other buildings but more rapidly if not well maintained.

What is Adobe?

The adobe, or sun-dried brick, is one of the oldest and most common building materials known to man. Unbaked adobe bricks consisted of sand, sometimes gravel, clay, water, and often straw or grass mixed together by hand, formed in wooden molds, and dried by the sun.

Traditional adobe construction techniques in North America have not varied widely for over 3½ centuries. Adobe building methods employed in the Southwest in the 16th century are still used today, and are similar to those used in other parts of the world (South America, Africa, and Middle East).

Stone may be used for a building's foundation, and wood may be used for its roof or its lintels and doorways. In the adobe building, these materials are generally held in place by their own weight or by the compressive weight of the wall above them.

Preserving and rehabilitating a deteriorated adobe building is most successful when the techniques and methods used for restoration and repairs are as similar as possible to the techniques used in the original construction.

Adobe Construction Techniques

The Brick: The adobe brick is molded from sand and clay mixed with water to a plastic consistency. Commonly, straw or grass is included as a binder. Although it is not proven that they help reinforce the bricks or give them added long-term strength, straw and grass do help the bricks shrink more uniformly while they dry. More important for durability, however, is the inherent clay-to-sand ratio found in local soil. The prepared mud is placed in wooden forms, tamped, and leveled by hand. The bricks are then "turned-out" of the mold to dry on a level surface covered with straw or grass so that the bricks will not stick. After several days of drying, the adobe bricks are ready for air-curing. This consists of standing the bricks on end for a period of 4 weeks or longer.

Dry adobe has a moisture content of 1-3 percent above which it becomes damp and loses strength. Unfortunately there is no data on expansion of adobe with changes in its moisture content. The coefficient of thermal expansion is reported to vary between 0.5×10^{-6} to 14.2×10^{-6} cm/cm per °C., this wide range reflecting different local soil characteristics.

Mortar: Historically, most adobe walls were composed of adobe bricks laid with mud mortar. Such mortar exhibited the same properties as the bricks: relatively weak and susceptible to the same rate of hygroscopic (moisture absorptive) swelling and shrinking, thermal expansion and contraction, and deterioration. Consequently, no other material has been as successful in bonding adobe bricks. Cement mortars accelerate the deterioration of adobe bricks since the mortars are stronger than the adobe.

Building Foundations: Early adobe building foundations varied because of the difference in local building practices and availability of materials. Many foundations were large and substantially constructed, but others were almost nonexistent. Most often, adobe building foundations were constructed of bricks, fieldstones, or cavity walls (double) infilled with rubble stone, tile fragments, or seashells. Adobe buildings in the USA were rarely constructed over basements or crawlspaces.

Walls: Adobe walls tended to be massive, and, in the USA seldom rose over 2 stories. In fact, the maximum height of adobe mission churches in the Southwest was approximately 35 feet (10.6 m). There are, however, many examples of earthen architecture in which buildings rise more than 2 stories (Peru, Mali, Spain, etc.). Often buttresses braced exterior walls for added stability.

In some parts of the Southwest, it was common to place a long wooden timber within the last courses of adobe bricks. This timber provided a long horizontal bearing plate for the roof thereby distributing the weight of the roof along the wall.

San Xavier del Bac, Tucson vicinity, Arizona. *Built entirely of adobe construction (1783-1797), this is one of the finest Spanish colonial churches in the United States, having an elaborate frontispiece of molded, carved, and painted brick imitating stone. Photo: National Park Service*

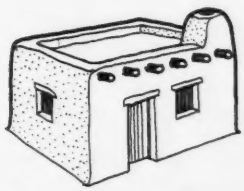
Roofs: Early Southwest adobe roofs (17th-mid-19th centuries) tended to be flat with low parapet walls. These roofs consisted of logs which supported wooden poles, and which in turn supported wooden lathing or layers of twigs covered with packed adobe earth. The wood was aspen, mesquite, cedar, or whatever was available. Roughly dressed logs (called *"vigas"*) or shaped squared timbers were spaced on close (2-3 feet or less) centers resting either on the horizontal wooden member which topped the adobe wall, or on decorated cantilevered blocks, called *"corbels,"* which were set into the adobe wall. Traditionally, these *vigas* often projected through the wall facades creating the typical adobe construction detail copied in the 20th-century revival styles. Wooden poles about 2 inches (5 cm) in diameter (called *"latias"*) were laid across the top of the *vigas*. Handsplit planks (called *"cedros"* if cedar and *"savinos"* if cypress) instead of poles were used when available. In some areas, these were laid in a herringbone pattern. In the west Texas and Tucson areas, *saguaro* (cactus) ribs were used to span between *vigas*. After railroad transportation arrived in most areas, sawn boards and planks, much like roof sheathing, became available and was often used in late-19th- and early-20th-century buildings or for repairs to earlier ones.

Next cedar twigs, plant fibers, or fabric were placed on top of the poles or planks. These

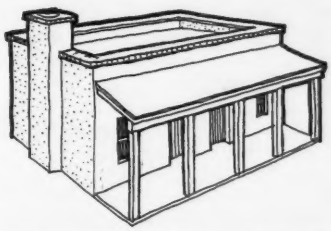
served as a lathing on which the 6 or more inches (15 cm) of adobe earth was compacted. If planks were used, twigs were not necessary. A coating of adobe mud was then applied overall. The flat roofs were sloped somewhat toward drains of hollowed logs (called *"canales,"* or *"gargolas"*), tile, or sheet metal that projected through the parapet walls.

Gabled and hipped roofs became increasingly popular in adobe buildings in the 19th and 20th centuries. "Territorial" styles and preferences for certain materials developed. For example, roof tiles were widely used in southern California.

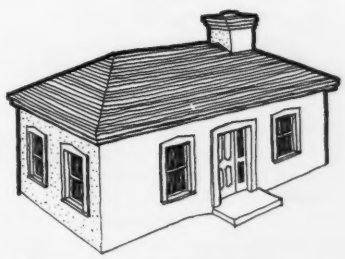
Floors: Flooring materials in adobe buildings have varied from earth to adobe brick, fired brick, tile, or flagstone (called *"lajas"*), to conventional wooden floors.



flat roof, small openings



brick coping, wood porch



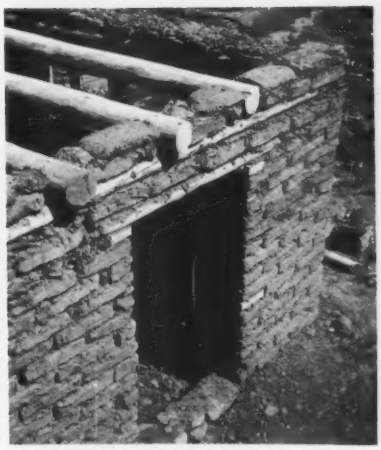
hip roof, wood trim

Evolution of Roof Forms. *The roofs of early adobe buildings were flat, made with mud, with low parapets. Later, brick copings were placed on top of parapets and chimneys to protect them from erosion, and shed roof porches were added to shelter doors and windows. After the railroad reached the Southwest, hip roofs and wooden trim began to appear as sawn lumber, shingles, tile, and sheet metal became available. Drawing: Albert N. Hopper*

Traditional Surface Coatings

To protect the exterior and interior surfaces of new adobe walls, surface coatings such as mud plaster, lime plaster, whitewash, and stucco have been used. Such coatings applied to the exterior of adobe construction have retarded surface deterioration by offering a renewable surface to the adobe wall. In the past, these methods have been inexpensive and readily available to the adobe owner as a solution to periodic maintenance and visual improvement.

Mud Plaster: Mud plaster has long been used as a surface coating. Like adobe, mud plaster is composed of clay, sand, water, and straw or grass, and therefore exhibits sympathetic properties to those of the original adobe. The mud plaster bonds to the adobe because the two are made of the same materials. Once in place, the mud plaster must be smoothed. This is done by hand; sometimes deerskins, sheepskins, and small, slightly rounded stones are used to smooth the plaster to create a "polished" surface. In some areas, pink or ochre pigments are mixed into the final layer and "polished."



Roof Bearing. *A roof bearing timber placed within the adobe walls provides even support for the weight of the roof. Photo: Farm Security Administration Collection, Library of Congress*

Roof Framing. *Viga logs and savinos are seen in the interior of the adobe building. Often the wooden materials that compose the traditional flat adobe roof create interesting and pleasing patterns on the ceilings of the interior rooms. Photo: Russell Lee, Farm Security Administration Collection, Library of Congress*

Whitewash: Whitewash has been used on earthen buildings since before recorded history. Consisting of ground gypsum rock, water, and clay, whitewash act as a sealer, which can be either brushed on the adobe wall or applied with large pieces of coarse fabric such as burlap.

Lime Plaster: Lime plaster was widely used in the 19th century as both an exterior and interior coating. Consisting of lime, sand, and water, it was applied in heavy coats with trowels or brushes. To make the lime plaster adhere to adobe, walls are often scored diagonally with hatchets, making grooves about 1½ (38 mm) inches deep. The grooves are filled with a mixture of lime mortar and small chips of stone or broken roof tiles. The wall is then covered heavily with the lime plaster.

Other Traditional Surface Coatings: These have included items such as paints (oil base, resin, or emulsion), coatings of plant extracts, and even coatings of fresh animal blood (mainly for adobe floors). Some of these coatings are inexpensive and easy to apply, provide temporary surface protection, and are still available to the adobe owner.

Adobe Deterioration

When preservation or rehabilitation is contemplated for a historic adobe building, it is generally because the walls or roof of the building have deteriorated in some fashion — walls may be cracked, eroded, pitted, bulging, or the roof may be sagging. In planning the stabilization and repair of an adobe building, it is necessary:

— To determine the nature of the deterioration,
— To identify and correct the source of the problem causing the deterioration,
— To develop rehabilitation and restoration plans that are sensitive to the integrity of the historic adobe building,
— To develop a maintenance program once the rehabilitation or restoration is completed.

General Advice: There are several points that when followed generally result in a relatively stable and permanent adobe resource.

1. Whenever possible, secure the services or advice of a professional architect or other preservationist proficient in adobe preservation and stabilization. Working with a deteriorated adobe building is a complex and difficult process. Irreversible damage may be done by well-meaning but inexperienced "restorationists." Moreover, professional assistance may be required to interpret local code requirements.
2. Never begin restoration or repairs until the

Deteriorated Adobe Building. *By virtue of its fragile nature, the adobe building must be restored by thorough, systematic, and professional measures that will insure its future survival. Photo: Technical Preservation Services Division*

Structural Damage and Cracking. *Sagging, bulging, and cracking of walls and roofs are signs of serious problems in the adobe building. It is always advisable to secure professional services in the repair of such problems. (National Park Service)*

problems that have been causing the deterioration of the adobe have been found, analyzed, solved, and documented. Because deterioration is almost always the end product of a combination of problems, it takes a trained professional to analyze the deterioration, identify the source or sources of deterioration, and halt the deterioration.

3. Repair adobe building materials with the same types of materials used originally and use the same construction techniques. Usually the best and safest procedure is to use traditional building materials. The problems created by introducing dissimilar replacement materials may cause problems far exceeding those which deteriorated the adobe in the first place.

Sources of Deterioration

The following are some common signs and sources of adobe deterioration and some common solutions. It should be cautioned again, however, that deterioration is often the end-product of more than one of the problems. The remedying of only one of these will not necessarily arrest deterioration if others are left untreated.

Structural Damage: There are several common structural problems in adobe buildings, and while the results of these problems are easy to see, their causes are not. Many of these problems originate from improper design or construction, insufficient foundations, weak or inadequate materials or the effects of external forces such as wind, water, snow, or earthquakes. In any case, the services of a soils engineer and/or structural engineer *knowledgeable in adobe construction* may be necessary to evaluate these problems. Solutions may involve repairing foundations, realigning leaning and bulging walls, buttressing walls, inserting window and door lintels, and repairing badly deteriorated roof structures. In any case, cracks, like all structural problems, should be examined by a conservation architect who can make recommendations for their repair.

Water Related Problems: The survival of an adobe building depends upon how effectively a structure sheds water. The importance in keeping an adobe building free from excessive moisture cannot be overestimated. The erosive action of rainwater and the subsequent drying out of adobe roofs, parapet walls, and wall surfaces can cause furrows, cracks, deep fissures, and pitted surfaces to form. Rain saturated adobe loses its cohesive strength and sloughs off, forming rounded corners and parapets. If left unattended, rainwater damage can eventually destroy adobe walls and roofs, causing their continued deterioration and ultimate collapse. Standing rainwater that accumulates at foundation level and rain splash may cause "coving" (the hollowing-out of the wall just above grade level).

Ground water (water below ground level) might be present because of a spring, a high water table, improper drainage, seasonal water fluctuations, excessive plant watering, or changes in grade on either side of the wall. Ground water causes the adobe to erode, bulge, and cove. Coving is also caused by spalling during the freeze-thaw cycles. As water rises the bond between the clay particles in the adobe brick breaks down. In addition, dissolved minerals or salts brought up from the soil by the water can be deposited on or near the surface of the wall as the moisture evaporates. If these deposits become heavily concentrated, they too can deteriorate the adobe fabric. As the adobe dries out, shrinkage cracks usually appear; loose sections of adobe bricks and mud plaster may crumble.

A water-tight roof with proper drainage is the best protection against rainfall erosion. Adobe wall and roof surfaces properly maintained with traditional tiles or surface coatings resist the destructive effects of rainwater. Roof drains should be in good repair and sufficient to carry rainwater run-off from the roof. In an effort to halt the destructive effects of rainwater, 19th-century builders often capped parapet walls with fired bricks. These bricks were harder and suited to weather the erosive action of rainwater.

Rainwater that has accumulated at adobe foundations should be diverted away from the building. This may be done by regrading, by building gravel-filled trenches or brick, tile, or stone drip gutters, or by any technique that will effectively remove the standing rainwater. Regrading is perhaps the best solution because defective gutters and trenches may in effect collect and hold water at the base of the wall or foundation.

Concrete patches, cement stucco, and curb-like buttresses against the coving have a negative effect because moisture may be attracted and trapped behind the concrete.

Cement stucco and cement patches have the potential for specific kinds of water-related adobe deterioration. The thermal expansion coefficient of cement stucco is 3 to 10 times greater than that of adobe, resulting in cracking of the stucco. Cracks allow both liquid water and vapor to penetrate the adobe beneath, and the stucco prevents the wall from drying.

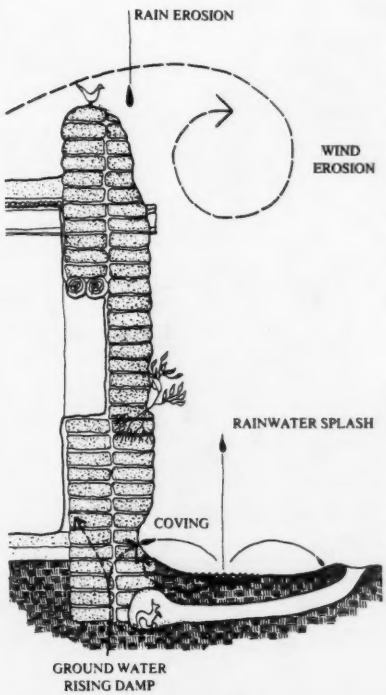
As the moisture content of the adobe increases, there is a point at which the adobe will become soft like putty. When the wall becomes totally saturated, the adobe mud will flow as a liquid.

If the adobe becomes so wet that the clay reaches its plastic limit, or if the adobe is exposed to a freeze-thaw action, serious damage can result. Under the weight of the roof, the wet adobe may deform or bulge. Since the deterioration is hidden from view by the cement stucco, damage may go undetected for some time. *Traditional adobe construction techniques and materials should, therefore, be used to repair or rebuild parts of the walls.*

The destructive effects of moisture on adobe buildings may be substantially halted by several remedies.

1. Shrubs, trees, and other foundation plantings may be causing physical damage. Their roots may be growing into the adobe, and/or they may be trapping excessive moisture in their roots and conducting it into walls. Their careful removal might be considered to halt this process.
2. Level ground immediately adjacent to the walls may be causing poor drainage. Regrading could be considered so that the ground slopes away from the building, eliminating rainwater pools.
3. The installation of footing drains may be considered. Trenches about 2 to 2½ feet wide (60-75 cm) and several feet deep are dug around the adobe building at the base of the walls or at the foundation if there is any. If the soil is weak, it may be necessary to slope the sides of the trench to prevent cave-in of the trench and subsequent damage to the wall. The walls and bottom of the trench should be lined with a polyethylene vapor barrier to prevent the collected water from saturating the surrounding soil and adobe wall. Clay tile, or plastic pipe, which drain to a sump or to an open gutter, are then laid in the bottom of the trench. The trench is

Coving. *Salts deposited by rising ground water can evaporate and cause spalling of the adobe bricks at the base of the wall, a serious condition called "coving." Coving can also be caused and/or exacerbated by the erosion of rain splash. Photo: National Park Service*



Water, Wind, Animal, Insect, and Vegetation Damage. *Most deterioration of buildings can be directly correlated with the presence of either rainwater, groundwater, or both. Successful adobe conservation depends upon keeping the adobe building well maintained. Drawing: David W. Look, AIA, based on sketches by Albert N. Hopper*

filled with gravel to within 6 inches (15 cm) of grade. The remaining excavation is then filled to grade with porous soil.

A Word of Caution: *Plant removal, regrading, or trenching may be potentially destructive to archeological remains associated with historic adobe building sites. Any disturbance of the ground should, therefore, be undertaken with prudence and careful planning by a conservation team.*

Once any one or all of these solutions has effectively minimized the problems of rising ground water, the coving and deterioration of the walls can be corrected by patching the area with new adobe mud and applying traditional surface coatings. Most important, surface coatings and patching only repair the effects of ground water and wind erosion; they cannot cure the cause.

Wind Erosion: Wind-blown sand has often been cited as a factor in adobe fabric erosion. Evidence of wind erosion is often difficult to isolate because the results are similar to water erosion; however, furrowing caused by wind is usually more obvious at the upper half of the wall and at the corners, while coving from rainsplash and ground water is usually at the lower third of the wall.

Maintenance is the key to mitigating the destructive effects of wind erosion. Wind damage on adobe walls and roof surfaces should be repaired with adobe mud. Any traditional surface coating may be applied to protect against any future destructive effects. If high wind is a continuing problem, a wind screen or breaker might be built, using fencing or trees. Care should be taken to plant trees far enough away from the structure so that the roots will not destroy the foundation or trap moisture.

Vegetation, Insects, and Vermin: Vegetation and pests are natural phenomena that can accelerate adobe deterioration. Seeds deposited by the wind or by animals may germinate in adobe walls or roofs as they would in any soil. The action of roots may break down adobe bricks or cause moisture retention which will harm the structure. Animals, birds, and insects often live in adobe structures, burrowing and nesting in walls or in foundations. These undermine and destroy the structural soundness of the adobe building. The possibility of termite infestation should not be overlooked since termites can travel through adobe walls as they do through natural soil. Wood members (lintels, floors, window and door shutters, and roof members) are all vulnerable to termite attack and destruction.

It is important to rid adobe structures immediately of all plant, animal, and insect pests and to take preventive measures against their return. Seedlings should be removed from the adobe as soon as they are discovered. Large plants should be removed carefully so that their root systems will not dislodge adobe material. Pest control involving the use of chemicals should be examined carefully in order to assess the immediate and long lasting effects of the chemicals on the adobe building. Professional advice in this area is important not only because chemicals may be transported into the walls by capillary action and have a damaging effect on the adobe fabric, but also for reasons of human and environmental safety.

Material Incompatibilities: Philosophies regarding adobe preservation have changed, and so have restoration and rehabilitation techniques. Techniques acceptable only 10 years ago are no longer considered appropriate. Until recently, adobe bricks have been repointed with portland cement; deteriorated wooden lintels and doors have been replaced with steel ones; and adobe walls have been sprayed with plastic or latex surface coatings. The nature of adobe has rendered these techniques ineffective and, most important, destructive. The high strength of portland cement mortar and stucco has caused the adobe brick to crack and crumble during the differential expansion of these incompatible materials. Steel lintels are much more rigid than adobe. When the building expands, the adobe walls twist because they are more flexible than the steel. Plastic and latex wall coatings have been used to seal the surface, keeping it from expanding with the rest of the brick. Portions of the wall have consequently broken off. In some instances, incompatible materials can be removed from the building without subsequently damaging the structure. Other times, this is not possible. Professional advice is therefore recommended.

Repairing and Maintaining the Historic Adobe Building

Once the adobe deterioration and any resulting structural damage is repaired, the restoration of the adobe building can proceed. Careful attention should be given to repair all damaged materials with traditional or original materials.

Patching and Repairing Adobe Brick: In patching and replacing adobe brick, every reasonable effort should be made to find clay with a texture and color similar to the original fabric. When an individual adobe brick has partially disintegrated, it may be patched in place. The deteriorated material may be scraped out and replaced with appropriate adobe mud. Often fragments of the original adobe brick have been ground up, mixed with water, and reused to patch the eroded area. However, some professionals advise against the reuse of material which has spalled off because it frequently contains a high concentration of salts.

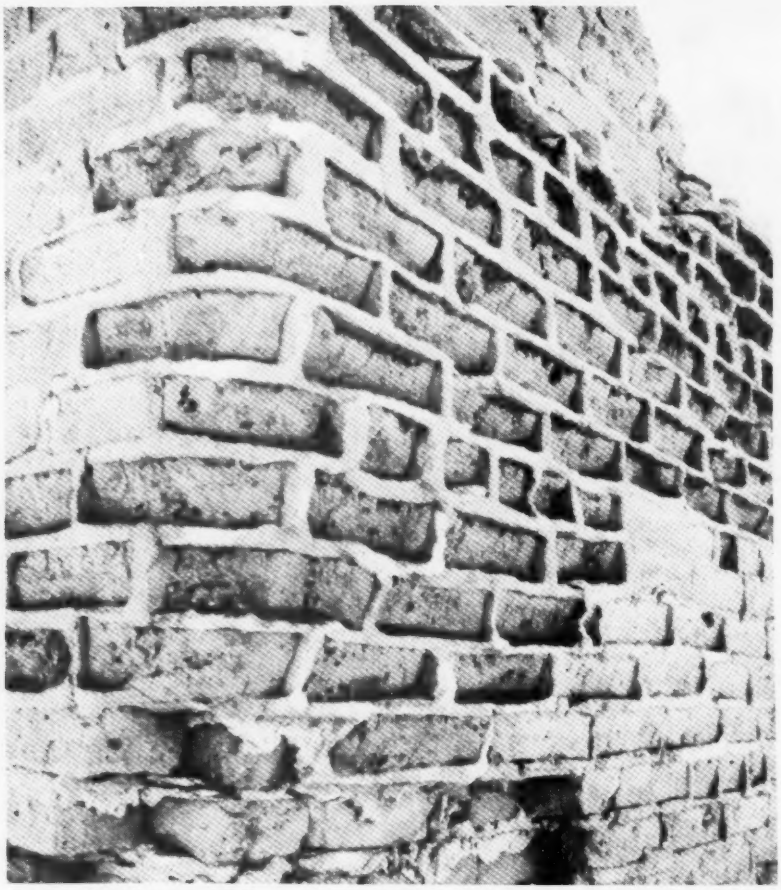
If a substantial amount of the brick has been destroyed, new half-bricks may be made at the site or nearby. Generally these are 3 or 4 inches thick, and ideally they are composed of unstabilized adobe (that is, without any chemical additives). The deteriorated adobe bricks should be scraped out to insert the new bricks. If most of the brick is not deteriorated, then the deteriorated portion may be replaced with a half-brick. It may be necessary to cut back into undeteriorated portions of the brick to achieve a flush fit of the new or half-bricks. Spray (do not

soak) the new brick and surrounding area lightly with water to facilitate a better bond. Too much moisture can cause swelling. Always use traditional adobe mud mortar.

Concrete blocks and cinderblocks are tempting solutions to extensive adobe brick replacement; but, like commercially stabilized adobe bricks, they are not compatible with older and more unstable adobe bricks.

Patching and Replacing Mortar: In repairing loose and deteriorated adobe mortar, care should also be taken to match the original material, color, and texture. Most important, never replace adobe mud mortar with lime mortar or

Renewing the Surface Coating. *Traditionally, adobe surface coatings that protected the fragile adobe building were renewed every few years. Women are seen here recoating an adobe wall with mud plaster mixed with straw at Chamisal, New Mexico. Photo: Russell Lee, Farm Security Administration Collection, Library of Congress*



Cement Mortor Incompatibility: *The stronger and less flexible cement mortar has caused the softer adobe bricks to crumble, thus leaving a "honeycomb" of cement mortar joints. Photo: National Park Service*

portland cement mortar. It is a common error to assume that mortar hardness or strength is a measure of its suitability in adobe repair or reconstruction. Mortars composed of portland cement or lime do not have the same thermal expansion rate as adobe brick. With the continual thermal expansion and contraction of adobe bricks, portland cement or lime mortars will cause the bricks—the weaker material—to crack, crumble, and eventually disintegrate.

Repairing and Replacing Wooden Members: Rotted or termite infested wood members such as *vigas, savinos,* lintels, wall braces, or flooring should be repaired. Wood should always be replaced with wood. For carved corbels, however, specially formulated low-strength epoxy consolidants and patching compounds may be used to make repairs, thus saving original craftsmanship. Tests, however, should be made prior to repairs to check on desired results since they usually are not reversible. This is an area of building repair that ought not be attempted by the amateur. For further information, see *Epoxies for Wood Repairs in Historic Buildings,* cited in the reading list.

Patching and Replacing Surface Coatings: Historically, almost every adobe building surface was coated. When these coatings deteriorate, they need to be replaced. Every effort should be made to recoat the surface with the same material that originally coated the surface.

When the coating has been mud plaster, the process requires that the deteriorated mud plaster be replaced with like materials and similar techniques, attempting in all cases to match the repair work as closely as possible to the original. It is always better to cover adobe with mud plaster even though the mud plaster must be renewed more frequently.

The process is not so simple where lime plaster and portland cement stuccos are involved. As much of the deteriorated surface coating as possible should be removed without damaging the adobe brick fabric underneath. Never put another coat of lime plaster or portland cement stucco over a deteriorated surface coating. If serious deterioration does exist on the surface, then it is likely that far greater deterioration exists below. Generally this problem is related to water, in which case it is advisable to consult a professional.

If extensive recoatings in lime plaster are necessary, the owner of an adobe building might consider furring out the walls with lathing, then plastering over, thus creating a moisture barrier. Always patch with the same material that is being replaced. Although lime plaster is less satisfactory as a surface coating, many adobe buildings have always had it as a surface coating. Complete removal is inadvisable as the process may prove to be more damaging than the natural deterioration.

Roofs: Flat adobe roofs should be restored and maintained with their original form and materials; however, it may not be feasible or prudent to restore or reconstruct a flat adobe roof on a building if the roof has previously been modified to a gable roof with tiles, or wood shingles.

If an existing flat adobe roof is restored with a fresh layer of adobe mud over an existing mud roof, care should be taken to temporarily support the roof during the work because adobe mud is heavier wet than after it has cured. If not supported, the roof may collapse or deflect. If the wooden roof supports are allowed to sag during such work, the wood may take a permanent deflection, resulting in inadequate drainage and/or "ponding" at low points. Ponding is especially damaging to adobe roofs since standing water will eventually soak through the mud and cause the wooden roof members to rot.

On an adobe building, it is not advisable to construct a new roof that is heavier than the roof it is replacing. If the walls below have uncorrected moisture problems, the added weight of a new roof may cause the walls to bulge (a deformation caused while the adobe mud is in a plastic state). If the walls are dry but severely deteriorated, the added weight may cause the walls to crack or crumble (compression failure).

Floors, Windows, Doors, Etc.: Every reasonable effort should be made to retain original interior and exterior details.

Maintenance

Cyclical maintenance has always been the key to successful adobe building survival. As soon as rehabilitation or restoration has been completed, some program of continuing maintenance should be initiated. Changes in the building should particularly be noted. The early stages of cracking, sagging, or bulging in adobe walls should be monitored regularly. All water damage should be noted and remedied at its earliest possible stages. Plant, animal, and insect damage should be halted before it becomes substantial. The roof should be inspected periodically. Surface coatings must be inspected frequently and repaired or replaced as the need indicates.

Mechanical systems should be monitored for break-down. For instance, leaking water pipes and condensation are damaging to the adobe building. Observing adobe buildings for subtle changes and performing maintenance on a regular basis is a policy which cannot be over emphasized. Cyclical maintenance can substantially deter deterioration, thus producing a stable historic adobe building.

Summary

The preservation of historic adobe buildings is a broader and more complex problem than most people realize. Competent preservation and maintenance of historic adobe buildings must (1) understand a building as a system, and (2) understand the forces of nature which seek to break it down to its original materials.

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The basic material in this article was taken from Preservation Brief No. 5, "Preservation of Historic Adobe Buildings," revised and adapted for the world audience of PARKS magazine by Dr. Alejandro Alva, a preservation architect and expert on the staff of ICCROM (International Centre for the Study of the Preservation and Restoration of Cultural Property), 13 via di S. Michele, 00153 Rome, Italy. Preservation Brief No. 5 was developed under the technical editorship of Lee H. Nelson, A.I.A., Technical Preservation Services Division, U.S. National Park Service, and originally published in 1978.

Ways to Prevent Confrontations Between Backpackers and Bears

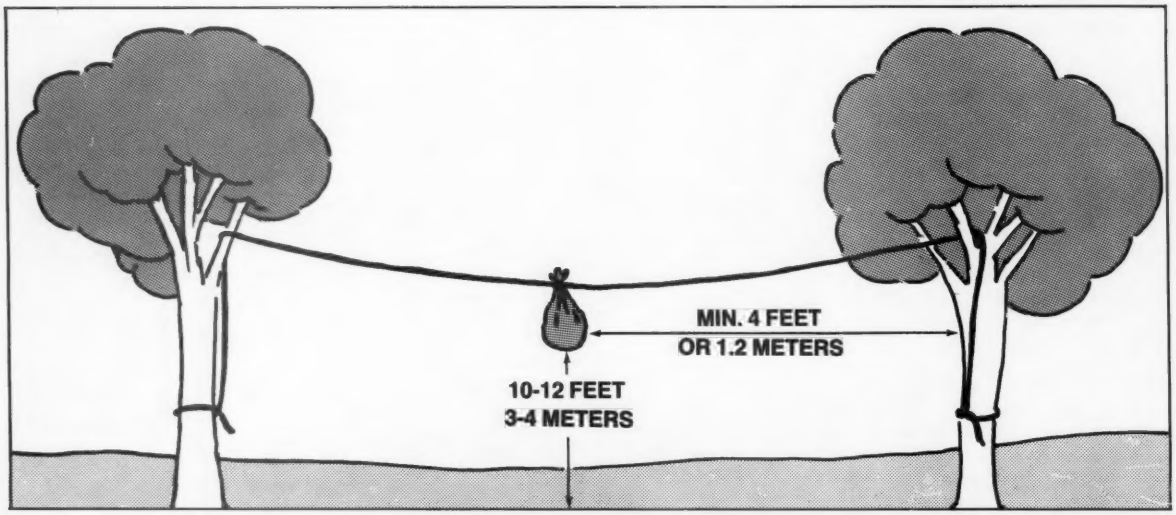
Roger D. Applegate

There has been a definite increase in backcountry use in parts of North America inhabited by black bears *(Ursus americanus)* or grizzly bears *(U. horribilis)*. In the Great Smoky Mountains National Park there were 715 black bear property damage incidents between 1964 and 1976, mostly in the backcountry. During this same period there were 107 human injuries from black bears. Most injuries were the result of visitors in the front country disobeying park regulations. (Singer and Bratton 1977). In Glacier National Park, Montana, greater backcountry use increased bear encounters after 1955. During the period 1939-80 there were 24 injuries and 6 fatalities resulting from grizzly encounters (C. J. Martinka, Glacier N.P., pers. comm. 28 April 1981).

Most bear incidents in these areas have been the result of negligence on the part of human visitors or by bears that use garbage dumps. Management programs of the National Park Service have aimed at arresting increases of bear confrontations, but visitation to bear country has continued to soar. In Glacier alone the rate of grizzly confrontations resulting in injury or death has increased from .60 (1960s), to .69 (1970s), to .79 (1980) per million visits (C. J. Martinka, Glacier N.P. pers. comm. 28 April 1981).

The following is essentially a checklist of do's and don'ts for backcountry camping in bear range. It was kindly reviewed by U. S. National Park Service biologists C. J. Martinka (Glacier National Park, Montana), S. P. Bratton (Great Smoky Mountain N.P., Tennessee-North Carolina), and G. Brown, (Forestry, Fire and Bear Management Specialist, Yellowstone N.P., Wyoming.) Their comments and suggestions are greatly appreciated.

1. When planning a trip, contact forest or park officials about potential bear problems in their area. Try to plan trips to areas away from large concentrations of bears.
2. When arriving at the area, contact officials on campsites having chronic bear problems. Many managers limit or stop use in these areas. File a trip plan and never travel alone.
3. When packing gear place all food and cooking items in airtight containers. Plastic bags are cheap and weigh very little. Try to pack food away from bedding or other items to be taken into tent.
4. Sing or talk while hiking in bear country. Carry and use a rattle (several stones in a tin can). This may not be totally effective, especially against black bears in the eastern states.
5. Separate cooking and sleeping areas, even if it means having dinner in late afternoon and hiking an additional kilometer (0.6 mile). This will minimize food odors around campsite.
6. Bear-proof food and cook gear and garbage by using whatever means are provided at the site, or by stringing it between



Plastic bags are light weight, air tight when properly sealed, take little room in a pack, and can be used for many purposes. Campers should always carry a plentiful supply.

Small plastic bags can be filled and sealed, then packed in a larger, sturdy bag for easy carrying. Photos by Jean E. Packard

two trees. Gear should be hoisted at least 3-4 meters (10-12 feet) high and 1.2 meters (4 feet) from any post or tree trunk.

7. Never take food into your tent or eat at the campsite.
8. All garbage should be packed in airtight containers and packed out. Do not burn any garbage.
9. Women should pack sanitary pads in airtight containers. It is better to stay out of grizzly areas during the menstruation period.
10. Never camp in an area where fish are being caught and cleaned. If you plan to fish you should clean and prepare fish well away from the camp.
11. Never approach bears for photographs or any other reason.
12. Refrain from sexual activity when in grizzly country.

Park management agencies should issue accurate and up-to-date brochures on dealing with bear problems. The above guidelines are a good start. One of the biggest problems that I discovered while reviewing literature and corresponding with parks and wildlife personnel on this topic was that there seems to be a great difference in opinion on many aspects of bear management in recreational areas. This indicates a strong need for research studies on bear behavior around public use areas.

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R. D. Applegate is presently employed by an Illinois outfitter and does private research and consulting work on wildlife management/recreation resource management problems. His experience includes 12 years in fish and wildlife management in the midwest and southeastern U.S.A.

Energy-efficient Ranger Housing

Bob Barford

Australia's Northern Territory, a vast area nearly half as large as Argentina, ranges from arid desert in the south to warm swampy coastline in the far north. Much is sparsely populated.

The Conservation Commission of the Northern Territory has been working on solar projects to supply hot water and electricity at its remote parks (see PARKS Vol. 7, No. 1, pp. 20-21), and energy-efficient housing. The following notes taken from correspondence describe two housing models.–Ed.

I have also included some photographs of energy-efficient ranger housing. This project has been underway now for about 5 years (now 6 years—Ed.) and we are constantly upgrading the designs on new staff housing as materials and technology allows.

In our arid location we are faced with high summer temperatures (40°c+) and low winter temperatures (−5°c) and so our passive systems need some manipulation.

The photograph of our Southern (arid) design shows:

1. Heat exchange units below the north-facing windows which are used to draw heated air into the building.
2. Large eaves to provide shade on the walls in summer.
3. Solar hot water system.
4. Central skylight which is open in the winter and covered in the summer.
5. Winter heating is provided by a centrally located open fireplace. The flue may be seen projecting from the centre of the skylight.

The system appears to work efficiently during the winter. The most common concession to non-passive methods is the installation of evaporative air-conditioning for summer cooling.

In the tropical north, ventilation is the main requirement. This is achieved by the use of a raised atrium which allows hot air to escape thus drawing in cooler air through the numerous louvered openings. Again shade is provided by generous eaves. Solar water heaters are also

Northern (tropical) design

Southern (arid) design

used. The concession in this case is the installation of ceiling fans to create greater air movement.

Solar irrigation pumps have also been used in a few locations. These involve the use of photovoltaic cells providing power to an electric motor which in turn drives the pump. An essential part of this system is a large water storage capacity.

An important factor in the installation of solar equipment is the sun angle. We of course face our collectors and cells north since we are in the Southern hemisphere. The angle is determined directly from the degree of latitude (approximately 24° for Alice Springs).

Bob Barford is Publications Officer for the Conservation Commission of the Northern Territory.

Stake Saver

When using a number of stakes for anchoring, ever have trouble with the end splitting?

From Straits State Park, Michigan Department of Conservation, comes a brief but helpful solution to this problem. End splitting can be prevented by slipping a tin can over the stake. After the removal of both ends of the can, you will find it a good reinforcing band. Just slip the open end over the stake top and start pounding!

This item was reprinted from Grist, *November-December 1968.*

IUCN commission on National Parks and Protected Areas

CNPPA NOTES

Camargue is Protected as Ramsar Text Approved in French, German, Russian

The Camargue, swamp-land paradise of wild white horses and pink flamingos in the Rhone delta, is now protected under a global nature conservation treaty. This was announced by France's Ambassador to Unesco, Mrs. Jacqueline Baudrier in what observers consider as a major move by the Mitterand Government in the field of international environmental policy.

The announcement on 3 December 1982 came at the close of a two-day conference in Paris, after France obtained equal status for the French text of the 1971 Convention on Wetlands of International Importance especially as Waterfowl Habitat (known as the "Ramsar Convention"), which previously was authentic in English only. The language problem had been the diplomatic obstacle which for 11 years prevented France and some other francophone countries from joining the Convention.

The Paris Conference, chaired by Nalni D. Jayal, State Secretary of India's Environment Ministry, also finalized an amendment procedure designed to make the Convention more flexible and adaptable to future changes. In addition to English and French, German and Russian language texts were authenticated. New Arabic, Chinese and Spanish versions are to be added at the next conference, scheduled to be held in the Netherlands in 1984.

The treaty now covers 265 nature reserves in 34 countries, ranging from Australia to the USSR, and representing a total area of 175,000 square kilometers. It is administered by IUCN, which organized the Paris Conference, with Unesco serving as the Depository body for the Convention.

From CNPPA members' Newsletter No. 21, Dec. '82-Jan. '83.

Australia, South Africa Add New Parklands

In Australia, two National Nature Reserves have been declared in the Coral Sea Island Territory northeast of the Australian mainland. Coringa-Herald and Lihou Reef National Reserves will afford protection to some 1,700 sq. km. in the central part of the Coral Sea Territory. They consist of vegetated islets and sandy caves and a remarkable horse-shoe shaped reef system in surrounding waters. They provide habitat for a wide range of marine life and sea birds as well as interesting islet vegetation. The areas will be managed in accordance with management plans to be prepared by the Australian National Parks and Wildlife Service, with appropriate public participation.

In South Africa, new national parks have been approved at the West Coast National Park at Langebaan Lagoon and Vaalbos National Park near Berkeley West in Kalahari Sand Belt.

In Canada, 18 properties located along the famous West Coast Trail are now being transferred to the Federal Government by the Province of British Columbia, to become part of the Pacific Rim National Park. These properties, totalling 77 ha, have recently been acquired by the Province, which agreed to obtain the lands under a cost-sharing agreement with the Federal Government.

From CNPPA members' Newsletter No. 21, Dec. '82-Jan. '83.

U. of Michigan Offers Seminar on Management

The University of Michigan is offering a seven-week certificate programme for professionals having responsibility for natural resource related policy, management and project formulation in developing nations. A broad range of subjects, including agriculture, livestock, renewable and nonrenewable energy sources, forestry, fisheries, minerals exploitation, national parks and reserves, desertification, and environmental quality will be covered.

The course, which will be held from 4 May to 24 June, 1983, will focus on 3 courses: multi-objective planning and project analysis; agriculture, natural resources and economic development; and international resource management seminar. The course will include a film and discussion series, guest speakers and field trips. The cost will be US $1,700 for the program fee, and US $1,100 as a housing fee with all meals included.

For further information contact Professor Paul F. Novac, The University of Michigan, School of Natural Resources, Dana Building, Ann Arbor, MI 48109, USA.

From CNPPA members' Newsletter No. 21, Dec. '82-Jan. '83.

34 States Now Parties To Ramsar Convention

During 1982 both Spain and Mauritania joined the Convention on Wetlands of International Importance especially as Waterfowl Habitat, becoming the 32nd and 33rd parties, respectively.

IUCN's Commission on National Parks and Protected Areas would be happy to provide information on the Convention to any country interested in adhering.

As of the end of 1982 the list of contracting states was as follows:

Australia, Bulgaria, Canada, Chile, Denmark, Finland, France, German Democratic Republic, Federal Republic of Germany, Greece, Hungary, Iceland, India, Iran, Italy, Japan, Jordan, Mauritania, Morocco, Netherlands, New Zealand, Norway, Pakistan, Poland, Portugal, Senegal, South Africa, Spain, Sweden, Switzerland, Tunisia, Union of Soviet Socialist Republics, United Kingdom of Great Britain and Northern Ireland, and Yugoslavia.

Three More Countries Join World Heritage Convention

Three more countries have joined the World Heritage Convention — Holy See, Belize, and Zimbabwe — to bring the total membership now to 69 countries. Although the Convention is still relatively weak in Southeast Asia, its membership continues to grow as the Convention takes its place among the most important international legal instruments supporting conservation. The membership of Zimbabwe means that a number of important natural areas become available for World Heritage attention. Prominent among these is the 220,000 ha Mana Pools National Park, Zimbabwe's best area for large mammals, and the Victoria Falls and Zambesi Gorge (shared with Zambia).

From Belize, the Belize Barrier Reef is certain to attract the attention of the World Heritage Committee. It is the second largest barrier reef in the world and the greatest such reef in the western hemisphere (Australia's Great Barrier Reef was put on the World Heritage List in 1981).

From CNPPA members' Newsletter No. 21, Dec.' 82-Jan. '83.

BOOKS AND NOTICES

United Nations List of National Parks and Protected Areas. 1982. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland, pp 154. US $12.00, includes postage and handling. French and English text.

Compiled by the IUCN's Commission on National Parks and Protected Areas, the 1982 List is the first to be prepared by the IUCN's Protected Areas Data Unit, and advances from the format used in previous editions. The protected areas in each country are now listed together, and are classified according to management category as defined in the 1978 IUCN report "Categories, Objectives and Criteria for Protected Areas." The text material is in both French and English on facing pages.

Although previous lists included only national parks and nature reserves, this edition also carries natural monuments, managed nature reserves, protected landscapes, biosphere reserves and World Heritage sites. A few resource areas are also included — mainly those designated as "national parks," but not adequately managed as such and hence not qualified for listing under that category.

As with previous editions, only areas over 1000 hectares are included, unless the conservation units are islands. Each area is classified as to biogeographic realm, province and biome, as defined by Udvardy in 1975. These criteria are outlined in considerable detail in early chapters of the List.

The only details included for individual areas are size and the date established. During the next few years directories of protected areas in each biogeographic realm will be published by IUCN (see review of Directory of Neotropical Areas which follows).

The present list is unlikely to be entirely accurate, and is certainly not complete. In future years CNPPA hopes to include all categories of conservation units, but at present the information is variable. The Commission and PADU will continue to compile additional data, and the List provides a form for updating and correcting the published data.

In the present List some protected areas have been included on a tentative basis only because of disturbing factors that endanger the effectiveness of their protection. It is hoped that the authorities concerned will intensify their efforts to improve the protection.

The List was prepared with the assistance of the United Nations Environment Programme, the United Nations Educational, Scientific and Cultural Organization, and the World Wildlife Fund/IUCN. — *Jean R. Packard*

IUCN Directory of Neotropical Protected Areas. 1982. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland, pp 436 illus. US $35.00. Developing country rate US $22.75.

This Directory is a companion of the 1982 List of National Parks and Protected Areas, concentrating on the biogeographical area that includes all of South America, the Caribbean, Central America, tropical Mexico, and the southern tip of Florida, US. This realm is divided into provinces (defined by significant differences in flora, fauna and vegetation structure), and further subdivided into biomes, or major ecological communities of plants and animals extending over a large natural area. Approximately 140 areas are categorized in this volume.

With greatly increased responsibilities for helping ensure that social and economic development meets the real needs of society, protected areas are now receiving a significantly greater support from governments, international agencies and local people. No longer just playgrounds for vacationers and means of conserving natural heritage, protected areas have become an inseparable part of the human ecosystem.

This Directory is the first in a series that will document the protected areas of the world and the increasingly important role they are playing in human society. The series will bring together basic information on virtually all the protected areas around the world.

Data on each of the areas include the management category (national park, wildlife sanctuary, etc.), biogeographical province, degree of legal protection, date established, geographical location, altitude, area, physical features, vegetation, noteworthy fauna, zoning, disturbances or deficiencies, special scientific features, staff, budget, local administration, principal reference material, and the date the information was provided. There is a brief description of each country, outlining the parks and reserves legislation and administration, and a map locating each of the protected areas in that country.

All of this material was gathered on data sheets prepared by the respective countries and coordinated by CNPPA members in their own areas. The data are coordinated with other information gathered by CNPPA and filed by the Protected Areas Data Unit both manually and by computer in such a way that it can be retrieved on demand in the most useful format.

By carefully assessing the coverage of protected areas in each biogeographical province on land and water, CNPPA will be able to identify gaps or weaknesses in the worldwide system of reserves; it will then be easier to chart the development of new areas each year, and to focus attention where it is most required.

Collecting and presenting protected areas information in a professional and competent manner demonstrates to governments, development agencies and individuals around the world that national parks and reserves are valuable land use tools for managing areas which should, for various reasons, be kept in a natural or semi-natural state. Making protected areas data more accessible will help ensure that the reserves can play their role in the process of socio-economic development. — *Jean R. Packard*

Footbridges in the Countryside, Design and Construction. 1981. Reiach Hall Blyth Partnership. Countryside Commission for Scotland, Battleby, Redgorton, Perth PH1 3EW, UK. 101 pp., paperbound; A4 size. £7.00 plus £1.50 for handling and surface postage to all countries. Airmail orders will be billed for the additional postage cost.

In a well-known handbook on facilities for countryside recreation, its author complained that "footbridges are one of the most difficult things to find information about." That, obviously, was written before the Countryside Commission for Scotland published this new guide for the design and construction of these essential field facilities. If there was a gap in technical guidance on this topic it has now been filled.

This guide does not, however, offer construction drawings for every bridging need. What it does do is present the whole topic in simplified text arranged in 11 sections, with 7 appendixes and 18 figures and tables. It is designed to help those "who wish to create elegant and long lasting footbridges."

The presentation is simple, logical, professional and practical. The type is clear and the drawings excellent. Section 1, for instance, deals with how to decide if a bridge is really needed, selection and survey of a site, deciding on the type of bridge needed (16 structural forms are pictured, described and analyzed for materials, spans, cost range, maintenance requirements, life expected, and design and construction classification.), siting the bridge, its relation to and design of the footpath, standards of workmanship, resources, and the consent needed from various agencies prior to construction.

Much of the material in the guide is for use by experienced designers. Sections 2 to 6 — excluding 5 — provide guidance on loadings, foundations, structures and materials. Engineers and architects would understand it, laymen probably would not. But the laymen would at least have a better understanding of the complexity of the subject, and be better able to deal with the professional. Section 5 offers seven standard short span designs for bridges under 9 meters in length. These are said to be applicable often without additional design work. Lists of materials and equipment needed are included.

The remaining sections discuss problems and methods of bridge erection, how to estimate costs and organize work, maintenance, safety and sources of financial aid or other assistance.

The guide was prepared to meet the specific needs of groups in Great Britain, and thus much of the Appendix material applies mainly to the UK. However, sample forms, tool lists, bibliographic data, etc. will have much wider application, and so, indeed, will the book as a whole. Any agency, large or small, should find this guidebook very useful if it has to site, build and maintain footbridges. — *Robert I. Standish*

Looking Forward. 1982. Charles Hatch Stoddard. Macmillan Publishing Co., Inc., New York. 224 pp., $14.75

In the last decade or so many prominent authors have addressed major social and environmental problems and suggested corrections. This book does that and much more: Author Charles Stoddard outlines step by step and in carefully-reasoned detail how government and business in the USA could be changed without major disruption of social values to make both far more responsive to the needs of American society and of mankind as a whole.

The author's starting thesis, one accepted by many of today's leading pragmatic thinkers, is that the world can no longer depend on growth of resource consumption as the prime mover of economic and social life. The basic truth of this point should be clear to anyone with eyes to see and the wit to draw conclusions from facts. Stoddard, however, is no mere hand-wringer. Where other authors simply cry for change he strides forward to outline in abundant detail alternatives to the outworn philosophy of materialism still espoused by most societies today. The new social direction should be what he calls the "conserver society" to substitute careful management for misuse, greed and wastefulness. As Stoddard presents the case, his proposals appear so logical and so desirable it is difficult to understand how most of our present political leaders have been able to avoid proposing such sensible advances, or if they have made such proposals why they haven't fought harder to bring them into effect. We all know in our hearts that changes must be made. We know we simply cannot go on as we are and that it is only a matter of time before the accelerating failure of institutions and programs forces us to change.

For those readers who may be interested in political science this book should be studied as a text on the US version of republican democracy, why it is failing, and what could be done about it.

For readers who are interested in ideas or courses more promising than the present apparently aimless drift toward crisis and catastrophe, this book charts sensible and accomplishable directions.

For those who may see only a bleak future, this book offers encouragement and hope.

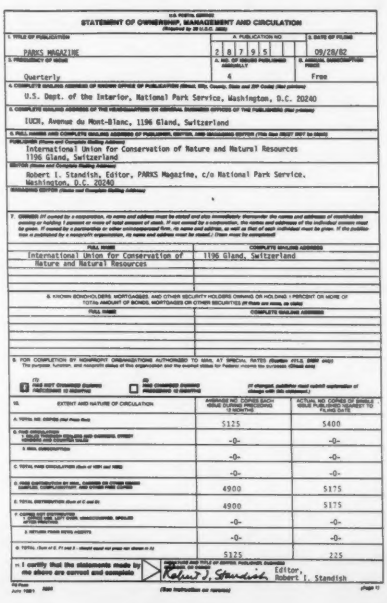
Charles Stoddard is no "ivory tower" intellectual. He has fought many battles in the real world of politics, government and business, and he has for many years been an active and effective leader in the American conservation movement. His new book deserves careful reading by concerned and thoughtful people everywhere. — *R. I. Standish*

Mangrove Ecosystems AV Program Now Available

"Understanding Mangrove Ecosystems" is an audio-visual presentation comprising 60 color slides, an illustrated script, and a pre-recorded cassette. Written by Larry Hamilton, from IUCN's Commission on Ecology, this program explains the ecology of mangrove ecosystems and their importance to man. It describes many of the threats facing the world's mangroves and suggests ways in which careful management could allow them to become an important renewable resource for the future.

The program provides an ideal way of communicating the importance of mangrove ecosystems to decision makers, planners, resource managers and students.

The presentation can be ordered from IUCN/WWF International Education Project, Greenfield House, Guiting Power, Gloucestershire, GL54 5TZ, United Kingdom. Enclose a check for £15 payable to IUCN/WWF Education Project. This includes the cost of the program plus airmail and bank charges.



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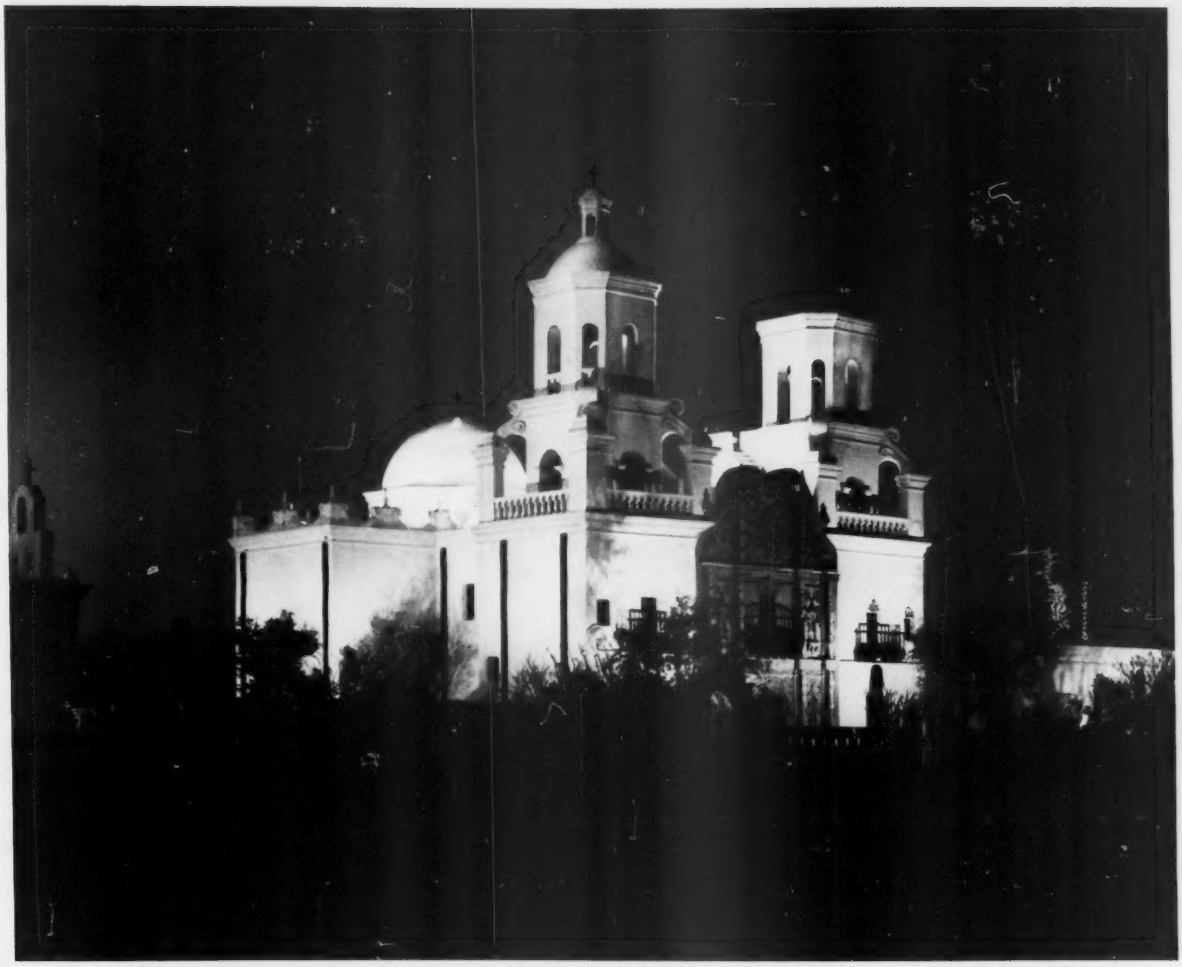

San Xavier del Bac near Tucson, Arizona, dates from the late 18th century. Built entirely of adobe and carefully maintained, it is one of the largest and finest churches of the Spanish colonial period in the southwestern part of the United States. The church is still in use today. Arizona State Museum, University of Arizona; Helga Teiwes, Photographer.

Back cover: Four of Canada's most scenic and heavily-used national parks lie along the Rocky Mountain chain which dominates western Alberta and eastern British Columbia. This is Cascade mountain, seen from the Trans-Canada Highway east of Banff National Park. The mountain is in the park. Photo: Martin Price

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EDITOR: Jean R. Packard

CONSULTING EDITOR: Robert I. Standish

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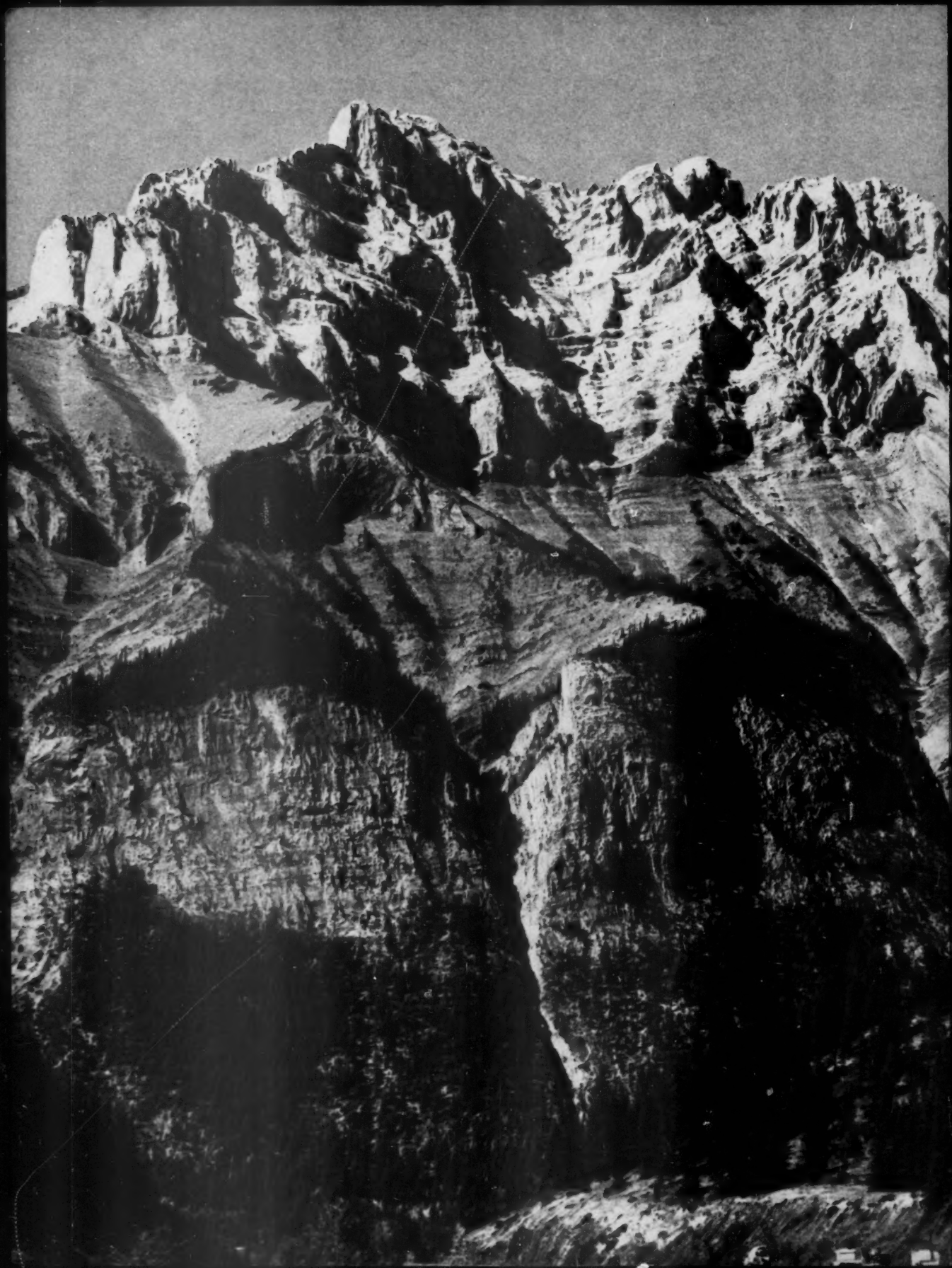
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